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PRE-APPEAL BRIEF REQUEST FOR REVIEW	Docket Number (Optional) SON-2968

	Application Number	Filed
	10/813,175-Conf. #4461	March 31, 2004
	First Named Inventor: Minoru Kawahara	
	Art Unit: 2627	Examiner: P. H. Gupta

Applicant requests review of the final rejection in the above-identified application. No amendments are being filed with this request.

This request is being filed with a notice of appeal.

The review is requested for the reason(s) stated on the attached sheet(s).
Note: No more than five (5) pages may be provided.

I am the

- [ ] applicant /inventor.
- [ ] assignee of record of the entire interest. See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96)
- [x] attorney or agent of record. Registration number 24,104/40,290
- [ ] attorney or agent acting under 37 CFR 1.34. Registration number if acting under 37 CFR 1.34. _____

Signature

Ronald P. Kananen/Christopher M. Tobin
Typed or printed name

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Telephone number

May 22, 2009
Date

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.

[x] *Total of 1 forms are submitted.

Docket No.: SON-2968
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Minoru Kawahara

Application No.: 10/813,175 | Confirmation No.: 4461

Filed: March 31, 2004 | Art Unit: 2627

For: RECORDING/ REPRODUCING DEVICE AND METHOD, RECORDING MEDIUM, AND PROGRAM | Examiner: P. H. Gupta

REQUEST FOR PRE-APPEAL BRIEF PANEL REVIEW OF REJECTION

MS AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Madam:

INTRODUCTORY COMMENTS

This is in full and timely response to the Office Action mailed on December 23, 2008.

Claims 1-15 are currently pending in this application.

No new matter has been added.

Reexamination in light of the following remarks is respectfully requested.

A clean copy of a **certified English translation** of Japanese Patent Application No. 2003-101584 has been provided along with this Response. M.P.E.P. §201.15.

Petition

A Petition Under 37 C.F.R. §1.181 to Request Withdrawal of the Final Office Action was filed on January 22, 2009.

Timely consideration of the Petition is respectfully requested.

New non-final Office Action

The non-final Office Action dated April 29, 2008 indicates a rejection of claims 1-15.

However, ***no amendment to the claims*** is found within the Response to Non-Final Office Action filed on August 28, 2008.

The Final Office Action of December 23, 2008 appears to repeat the rejection of claims 1-15 originally found within the non-final Office Action of April 29, 2008.

The Advisory Action of April 29, 2009 concludes on page 2 that:

> If a translation is filed and the claims are not amended, the WO publication will be used to reject the current claims as it overcomes the priority date of the present application.

In response, the use of the WO publication will be deemed a ***new ground*** of rejection. M.P.E.P. §§706.02(f)(1), 706.07(a).

Accordingly, if the allowance of the claims is not forthcoming at the very least and a new grounds of rejection made, then a ***new non-final Office Action*** is respectfully requested.

Claim rejections

Paragraph 2 indicates a rejection of claims 1-6, and 12-15 under 35 U.S.C. §103 as allegedly being unpatentable ***U.S. Patent Application Publication No. 2004/0027942 (Sako'942)*** in view of U.S. Patent No. 5,541,902 (Ten Kate).

Paragraph 3 indicates a rejection of claims 7-9 under 35 U.S.C. §103 as allegedly being unpatentable ***U.S. Patent Application Publication No. 2004/0027942 (Sako'942)*** in view of U.S. Patent No. 5,541,902 (Ten Kate) and in further view of U.S. Patent No. 6,937,549 (Nozaki).

Paragraph 4 indicates a rejection of claim 10 under 35 U.S.C. §103 as allegedly being unpatentable ***U.S. Patent Application Publication No. 2004/0027942 (Sako'942)*** in view of U.S. Patent No. 5,541,902 (Ten Kate) and in further view of U.S. Patent Application Publication No. 2003/0161233 (Sako'233).

Paragraph 5 indicates a rejection of claim 11 under 35 U.S.C. §103 as allegedly being unpatentable ***U.S. Patent Application Publication No. 2004/0027942 (Sako'942)*** in view of U.S. Patent No. 5,541,902 (Ten Kate), in further view of U.S. Patent Application Publication No. 2003/0161233 (Sako'233), and in further view of U.S. Patent No. 5,995,704 (Shido).

This rejection is traversed at least for the following reasons.

Present application - The above-identified application is entitled to benefit of the filing date for Japanese Patent Application No. 2003-101584 of **April 4, 2003**.

Sako'942 - The rejection of claims 29-32 relies upon U.S. Patent Application Publication No. 2004/0246434 (Sako'942).

Sako'942 has a PCT filing date of July 29, 2002.

However, Sako'942 is in the national stage (35 U.S.C. 371) of an International Application filed on or after November 29, 2000 and which was *not published in English* under PCT Article 21(2).

According to 35 U.S.C. 102 (e), ***no benefit of the international filing date*** (nor any U.S. filing dates prior to the IA) is given for 35 U.S.C. 102 (e) prior art purposes if the IA was published under PCT Article 21(2) in a language other than English, regardless of whether the international application entered the national stage. See M.P.E.P. §706.02(f)(1).

Sako'942 has a publication date of **February 12, 2004**.

Here, the filing date for Japanese Patent Application No. 2003-101584 of April 4, 2003 in the present application is ***earlier*** than the publication date of February 12, 2004 for Sako'942.

A clean copy of a **certified English translation** of Japanese Patent Application No. 2003-101584 has been provided along with this Response.

Thus, Sako'942 appears to be ***unavailable as prior art*** and that the rejection of the claims using this reference should be *withdrawn* as a result. MPEP § 201.15.

Moreover, the Final Office Action has concluded that **Sako'942 does not teach**:

- Reading back data while the recording of said data by said recording means is in progress (Final Office Action at page 2);
- Verification means for verifying the recording on said information recording medium based on said data stored by said storage means (Final Office Action at page 5);

- Setting means for setting at least one of an exhaustion limit value parameter and a frequency limit value parameter of collective readout for said readout of said data by said readout means in accordance with a communication speed (Final Office Action at page 6);

- Selection means to select at least one of an exhaustion limit value parameter and a frequency limit value parameter of collective readout for said readout of said data by said readout means (Final Office Action at pages 6-7).

Common ownership - *Sony Corporation* is the real party in interest of Sako'942. An assignment of all rights in Satoh to *Sony Corporation* was executed by the inventor and recorded by the U.S. Patent and Trademark Office **at reel 014365, frame 0065**.

The present application and Sako'942 were, at the time the invention of the present application was made, commonly owned by Sony Corporation of Tokyo, Japan.

But pursuant to 35 U.S.C. §103(c) and M.P.E.P §706.02(l)(1), ***Sako'942 is disqualified as prior art*** for the purpose of a rejection under 35 U.S.C. §103.

Withdrawal of this rejection and allowance of the claims is respectfully requested.

Dated: May 22, 2009

Respectfully submitted,

By _____ 40,290

Ronald P. Kananen
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VERIFICATION OF TRANSLATION

I, Yuki Takahashi,

Of 4th Floor, MATRICE 2-13-7, MINAMIAOYAMA MINATO-KU, TOKYO, 107-0062, JAPAN,

am the translator of the documents attached and I state that the following is a true translation to the best of my knowledge and belief of Japanese Patent Application No. 2003-101584.

Dated this on May 20, 2009

Yuki Takahashi

Signature of translator

[Document Name] Application for Patent
[Reference No.] 0390223604
[Application Date] April 4, 2003
[Destination] Commissioner, Patent Office
[International Patent Classification] G11B 20/00
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[Indication of Charge]
[Ledger Account No.] 032089
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[Object Name] Specification 1
[Object Name] Drawings 1
[Object Name] Abstract 1
[General Power of Attorney ID No.] 9708842
[Necessity of proof] Needed

[Document Name] Specification

[Title of the Invention] RECORDING/REPRODUCING DEVICE AND METHOD, RECORDING MEDIUM, AND PROGRAM

[Scope of Claim]

[Claim 1] A recording/reproducing device, characterized by comprising:

recording means for recording data on an information recording medium;

readout means for collectively reading out said data recorded on said information recording medium in units of a predetermined amount of data while the recording by said recording means is in progress; and

transmission means for transmitting said data read out by said readout means.

[Claim 2] The recording/reproducing device according to claim 1, characterized in that:

said recording means substantially simultaneously records first data at a high bit rate and second data at a lower bit rate than a bit rate of said first data, both data corresponding to a same material, on said information recording medium; and

said readout means collectively reads out said second data recorded on said information recording medium in units of a predetermined amount of data while the recording by said recording means is in progress.

[Claim 3] The recording/reproducing device according to claim 1, characterized in that said recording means intermittently records said first data and said second data on a physically same track on said information recording medium.

[Claim 4] The recording/reproducing device according

to claim 1, characterized in that:

said recording means records said data on said information recording medium by a constant linear velocity method; and

said readout means reads out said data recorded on said information recording medium while keeping a linear velocity of the recording by said recording means.

[Claim 5] The recording/reproducing device according to claim 1, characterized by further comprising storage means for temporarily storing said data to be recorded.

[Claim 6] The recording/reproducing device according to claim 5, characterized in that, in a case where data to be transmitted is stored by said storage means, said readout means interrupts the readout of said data while said transmission means transmits said data stored by said storage means.

[Claim 7] The recording/reproducing device according to claim 1, characterized by further comprising verification means for verifying the recording on said information recording medium based on said data stored by said storage means.

[Claim 8] The recording/reproducing device according to claim 7, characterized in that said transmission means diverts and transmits said data stored by said storage means to verify said recording on said information recording medium.

[Claim 9] The recording/reproducing device according to claim 7, characterized in that said verification means skips verification of said recording on said information recording medium if excessive time cannot be ensured by the readout with said readout means.

[Claim 10] The recording/reproducing device according to claim 1, characterized by further comprising setting means for setting at least one of an exhaustion limit value parameter and a frequency limit value parameter of collective readout for said readout of said data by said readout means in accordance with a communication speed.

[Claim 11] The recording/reproducing device according to claim 1, characterized by further comprising selection means for allowing a user to arbitrarily select at least one of an exhaustion limit value parameter and a frequency limit value parameter of collective readout for said readout of said data by said readout means.

[Claim 12] The recording/reproducing device according to claim 1, characterized in that said transmission means continues transmitting said data regardless of such a change of status as a start of recording and an end of recording by said recording means.

[Claim 13] A recording/reproducing method characterized by comprising:

a recording step of recording data on an information recording medium;

a readout step of collectively reading out said data recorded on the information recording medium in units of a predetermined amount of data while the recording in said recording step is in progress; and

a transmission step of transmitting said data read out in said readout step.

[Claim 14] A recording medium on which a program readable by a computer is recorded, said program being characterized by comprising:

a recording step of recording data on an information recording medium;

a readout step of collectively reading out said data recorded on said information recording medium in units of a predetermined amount of data while the recording in said recording step is in progress; and

a transmission step of transmitting said data read out in said readout step.

[Claim 15] A program characterized by making a computer execute a process comprising:

a recording step of recording data on an information recording medium;

a readout step of collectively reading out said data recorded on said information recording medium in units of a predetermined amount of data while the recording in said recording step is in progress; and

a transmission step of transmitting said data read out in said readout step.

[Detailed Description of the Invention]

[0001]

[Technical Field to which the Invention belongs]

The present invention relates to recording/reproducing device and method, a recording medium, and a program, and for example, to recording/reproducing device and method, a recording medium, and a program which are suitable for use in a case of recording video data on an information recording medium such as an optical disc and transmitting the recorded video data.

[0002]

[Background Art]

In recent years, information recording media such as optical discs of a remarkably improved recording rate have been put into practical use. On such information recording media, relatively high-quality video data can be recorded for long time.

[0003]

[Problem to be Solved by the Invention]

Incidentally, a conventional optical disc recording device for video images cannot externally transmit a file on a medium while recording is in progress. Therefore, there is a problem that recording is necessary to be stopped for transmission.

[0004]

One of the reasons is that a recording rate is close to a data rate, and thus the optical disc recording device is fully occupied by recording and therefore cannot perform reproduction. Another reason is as follows. In a case of a CLV (Constant Linear Velocity) method, the number of revolutions is significantly reduced when recording is performed on the outermost track. On the other hand, a sufficient relative speed cannot be obtained on the inner tracks. Therefore, even if two pickups are provided, data on the inner tracks cannot be read out at a speed equal to or higher than single speed.

[0005]

Since pieces of data to be subsequently transmitted are positioned in the relative vicinity, it is efficient to collectively read out the pieces of data from a disc because the number of seeks is reduced. If a transmission speed fluctuates, however, it happens that a

start of readout is too late, or data, which is not required to be immediately read out, is forced to be read out. In data transmission, a transmission speed constantly varies due to busyness or congestion of a transmission line. Therefore, even in a case where recorded data is immediately transmitted through a line that is not too busy, the data may be missed if a transmission speed becomes temporarily low. On the other hand, if data is read out from a disc so as to be transmitted, the readout sometimes catches up with writing. In such a case, the data, which has been just written, is uselessly read out immediately.

[0006]

The present invention has been made in view of the above-described circumstances, and an object of the present invention is to externally transmit already recorded data without interrupting recording, in particular, in recording of a video signal.

[0007]

[Means for Solving the Problems]

A recording/reproducing device according to the present invention is characterized by including: recording means for recording data on an information recording medium; readout means for collectively reading out the data recorded on the information recording medium in units of a predetermined amount of data while recording by the recording means is in progress; and transmission means for transmitting the data read out by the readout means.

[0008]

The recording means substantially simultaneously

record first data at a high bit rate and second data at a lower bit rate than a bit rate of the first data, both data corresponding to the same material, on the information recording medium; and the readout means can collectively read out the second data recorded on the information recording medium in units of a predetermined amount of data while recording by the recording means is in progress.

[0009]

The recording means can intermittently record the first data and the second data on a physically same track on the information recording medium.

[0010]

The recording means can record the data on the information recording medium by a constant linear velocity method; and the readout means can read out the data recorded on the information recording medium while keeping a linear velocity of recording by the recording means.

[0011]

The recording/reproducing device according to the present invention can further include storage means for temporarily storing the data to be recorded.

[0012]

In a case where data to be transmitted is stored by the storage means, the readout means can interrupt readout of the data while the transmission means can transmit the data stored by the storage means.

[0013]

The recording/reproducing device according the present invention can further include verification means

for verifying recording on the information recording medium based on the data stored by the storage means.

[0014]

The transmission means can divert and transmit the data stored by the storage means to verify the recording on the information recording medium.

[0015]

The verification means can skip the verification of the recording on the information recording medium if excessive time cannot be ensured by readout with the readout means.

[0016]

The recording/reproducing device according to the present invention can further include setting means for setting at least one of an exhaustion limit value parameter and a frequency limit value parameter of collective readout for the readout of the data by the readout means in accordance with a communication speed.

[0017]

The recording/reproducing device according to the present invention can further include selection means for allowing a user to arbitrarily select at least one of an exhaustion limit value parameter and a frequency limit value parameter of collective readout for the readout of the data by the readout means.

[0018]

The transmission means can continue transmitting the data regardless of such a change of status as a start of recording and an end of recording by the recording means.

[0019]

A recording/reproducing method according to the

present invention is characterized by including: a recording step of recording data on an information recording medium; a readout step of collectively reading out the data recorded on the information recording medium in units of a predetermined amount of data while recording in the recording step is in progress; and a transmission step of transmitting the data read out in the readout step.

[0020]

A program of a recording medium according to the present invention is characterized by including: a recording step of recording data on an information recording medium; a readout step of collectively reading out the data recorded on the information recording medium in units of a predetermined amount of data while recording in the recording step is in progress; and a transmission step of transmitting the data read out in the readout step.

[0021]

A program according to the present invention is characterized by making a computer execute a process including: a recording step of recording data on an information recording medium; a readout step of collectively reading out the data recorded on the information recording medium in units of a predetermined amount of data while recording in the recording step is in progress; and a transmission step of transmitting the data read out in the readout step.

[0022]

In the recording/reproducing device and method and the program according to the present invention, data is

recorded on an information recording medium. During the recording, the data recorded on the information recording medium is collectively read out in units of a predetermined amount of data so as to be transmitted.

[0023]

[Embodiment of the Invention]

Hereinafter, an embodiment of the present invention will be described. In order to clarify the correlation between each means of the inventions described in the Scope of Claim and the following embodiment, the features of the present invention will be described below in such a manner that each means is followed by a corresponding embodiment in parentheses (only one example for each means).

[0024]

Specifically, a recording/reproducing device according to the present invention (for example, a disc recording/reproducing device shown in Fig. 1) is characterized by including: recording means (for example, a disc drive 2 shown in Fig. 1) for recording data on an information recording medium; readout means (for example, the disc drive 2 shown in Fig. 1) for collectively reading out the data recorded on the information recording medium in units of a predetermined amount of data while recording by the recording means is in progress; and transmission means (for example, a transmission section 18 shown in Fig. 1) for transmitting the data read out by the readout means.

[0025]

Fig. 1 shows an exemplary configuration of a disc recording/reproducing device according to an embodiment

to which the present invention is applied. The disc recording/reproducing device encodes an input video signal at two image qualities that are a high or standard resolution and a lower resolution, by a predetermined encoding method. The resulting high bit-rate encoded data (at a high resolution or a standard resolution) and low bit-rate encoded data (at a low resolution) are recorded on an optical disc 1 and played back.

[0026]

Here, the high bit-rate encoded data is decoded so as to be provided for a user in normal playback. Hereinafter, the high bit-rate encoded data is also referred to as main track data as appropriate. On the other hand, the low bit-rate encoded data is decoded so as to be provided for a user in, for example, high-speed playback or editing. Hereinafter, the low bit-rate encoded data is also referred to as low resolution data as appropriate.

[0027]

The optical disc 1 can be inserted into and removed from the disc drive 2. In accordance with control by a drive control section 14 of a system controller 10, the disc drive 2 records the main track data or the low resolution data supplied from a PCI (Peripheral Component Interconnect) interface 3 on the optical disc 1 inserted to the disc drive 2 with a built-in pickup 2A. The disc drive 2 also reads out the main track data or the low resolution data recorded on the optical disc 1 with the pickup 2A so as to supply it to the PCI interface 3.

[0028]

The PCI interface 3 includes a buffer 31 (Fig. 3)

therein, and acts as an interface between the disc drive 2 and each of a main decoder 4, a low resolution decoder 5, a main encoder 15 and a low resolution encoder 17.

[0029]

For example, the PCI interface 3 supplies the main track data supplied from the disc drive 2 to the main decoder 4 while supplying the low resolution data similarly supplied from the disc drive 2 to the low resolution decoder 5. Furthermore, the PCI interface 3 also supplies the low resolution data supplied from the disc drive 2 to a transmission section 18.

[0030]

The PCI interface 3 also acts as an interface between the disc drive 2 and the main encoder 15 or the low resolution encoder 17 so as to supply the main track data supplied from the main encoder 15 to the disc drive 2 while supplying the low resolution data supplied from the low resolution encoder 17 to the disc drive 2.

[0031]

Here, a play list produced by non-destructive editing or the like can also be recorded on the optical disc 1. If the play list is recorded on the optical disc 1, the play list is read out from the optical disc 1 by the disc drive 2. Then, the readout play list is supplied to a controller 11 through the PCI interface 3. Furthermore, as described below, meta data or a time code is also recorded on the optical disc 1. The meta data or the time code is also read out from the optical disc 1 by the disc drive 2 so as to be supplied to the controller 11 through the PCI interface 3.

[0032]

The main decoder 4 includes a buffer 4A in which the main track data supplied from the PCI interface 3 is temporarily stored. Then, the main decoder 4 performs, for example, MPEG-decoding on the main track data stored in the buffer 4A in accordance with the control of a main decoder control section 13 of the system controller 10. Then, the main decoder 4 supplies the resulting high-resolution or standard-resolution video data (hereinafter, also referred to as main track video data as appropriate) to a switch 7. Furthermore, the main decoder 4 also supplies a ready flag, which indicates a ready state of an output of video data obtained by decoding the main track data supplied from the PCI interface 3, to the switch 7 and the main decoder control section 13.

[0033]

In this case, the ready flag is, for example, a 1-bit flag. In a case where the output of video data by the main decoder 4 is ready, the ready flag is set to, for example, 1. In a case where the output is not ready, the ready flag is set to, for example, 0.

[0034]

Note that the ready flag indicates an output preparation state of the main track data in a broad manner. Therefore, it is apparent that a case where the main decoder 4 is decoding a picture instead of decoding another picture that should be decoded is included in the output preparation state. In addition, a case where an error occurs in the main track data to prevent a picture from being decoded is also included in the output preparation state.

[0035]

The low resolution decoder 5 includes a buffer 5A in which the low resolution data supplied from the PCI interface 3 is temporarily stored. Then, the low resolution decoder 5 decodes the low resolution data stored in the buffer 5A by a predetermined method in accordance with the control of a low resolution decoder control section 12 of the system controller 10. Then, the low resolution decoder 5 supplies the resulting video data at a low resolution (hereinafter, also referred to as low resolution video data as appropriate) to a resize section 6.

[0036]

The resize section 6 is configured with poly-phase filters at, for example, 5:2 (3:1 in a case of PAL (Phase Alternation by Line) method) by 11:4. The resize section 6 thins out horizontal lines of the low resolution video data that is supplied from the low resolution decoder 5 and corresponds to, for example, progressive video data, in which one frame is composed of 30 horizontal lines, so as to generate interleaved video data, in which one field is composed of 60 horizontal lines. Furthermore, the resize section 6 interpolates pixels of the video data and the like so as to generate video data having the same size (the same number of pixels) as that of the main track video data output from the main decoder 4 (hereinafter, also referred to as resized video data as appropriate). Then, the resize section 6 supplies the thus generated video data to the switch 7.

[0037]

The switch 7 selects the main track video data output from the main decoder 4 or the resized video data

output from the resize section 6 in accordance with the ready flag supplied from the main decoder 4 so as to supply the selected one to an OSD (On Screen Display) section 8. The switch 7 also selects the main track video data output from the main decoder 4 or the resized video data output from the resize section 6 in accordance with the control from the controller 11 so as to supply the selected one to the OSD section 8. Therefore, in the embodiment shown in Fig. 1, the selection for any one of the main track video data and the resized video data to be output by the switch 7 can be made not only by the ready flag but also by the control from the controller 11.

[0038]

The OSD section 8 superimposes information such as a time code on the video data supplied from the switch 7 as needed so as to supply it to a scan converter 9. The scan converter 9 converts a scanning method of the video data supplied from the OSD section 8 as needed so as to supply it to a display 22. The OSD section 8 includes a buffer for storing the video data supplied from the switch 7. In high-speed playback, the OSD section 8 combines a plurality of video data obtained by decoding the low resolution data supplied from the switch 7 in accordance with the control from the system controller 10 so as to output the combined video data to a later stage. A process in the high-speed playback will be described below with reference to Fig. 16 and the subsequent drawings.

[0039]

The controller 11; the low resolution decoder control section 12; the main decoder control section 13;

and a drive control section 14 constitute the system controller 10. The system controller 10 controls each of the blocks that constitute the device.

[0040]

More specifically, the controller 11 receives an operating signal supplied by manipulation of a remote commander (or a remote controller) 21 by a user, and the play list, the time code or the meta data supplied from the PCI interface 3 so as to control the switch 7, the low resolution decoder control section 12, or the like in accordance with the operation signal, the play list, the time code, the meta data or the like.

[0041]

The low resolution decoder control section 12 controls the low resolution decoder 5 and the drive control section 14 in accordance with the control from the controller 11.

[0042]

The main decoder control section 13 monitors the control on the low resolution decoder 5 by the low resolution decoder control section 12 and controls the main decoder 4 and the drive control section 14 so as to follow the control.

[0043]

The drive control section 14 is configured with, for example, a file system and a device driver. The drive control section 14 controls the disc drive 2 in accordance with the control from the low resolution decoder control section 12 and the main decoder control section 13.

[0044]

The main encoder 15 encodes video data, which is input so as to be recorded, at a predetermined high bit rate by an MPEG-encoding method or the like. Then, the main encoder 15 outputs the resulting main track data to the PCI interface 3. A resize section 16 performs a reverse process to that performed by the resize section 6 on the video data which is input so as to be recorded. The resize section 16 outputs the resulting progressive video data, in which one frame is composed of 30 horizontal lines, to the low resolution encoder 17. The low resolution encoder 17 encodes the video data input from the resize section 16 by a JPEG (Joint Photographic Coding Experts Group) encoding method or the like at a predetermined low bit rate lower than the bit rate of encoding by the main encoder 15. Then, the low resolution encoder 17 outputs the resulting low resolution data to the PCI interface 3.

[0045]

The remote commander 21 outputs, for example, an infrared ray operating signal in accordance with the manipulation by a user. The display 22 displays the video data supplied from the scan converter 9.

[0046]

In the embodiment shown in Fig. 1, for example, the system controller 10 can be configured with software, whereas the blocks other than the system controller 10 can be configured with dedicated hardware, respectively. Moreover, for example, the main decoder 4, the low resolution decoder 5, the resize section 6, the switch 7, the main encoder 15, the resize section 16, the low resolution encoder 17 and the like can be configured by

making a DSP (Digital Signal Processor) or the like execute a program. Furthermore, the system controller 10 may be configured with dedicated hardware instead of software.

[0047]

In the disc recording/reproducing device shown in Fig. 1, the recording or reproducing is performed on the optical disc 1. However, information recording media other than the optical disc, for example, a magnetic disk, a magneto-optical disc or a magnetic tape may also be used for recording or reproducing of data.

[0048]

Next, Fig. 2 shows a recording format of the optical disc 1.

[0049]

The optical disc 1 is, for example, a CLV (Constant Linear Velocity) system optical disc. A track of the optical disc 1 is divided into a plurality of sectors. Furthermore, a cluster corresponding to a unit of reading/writing data from/on the optical disc 1 is composed of at least one sector. In this case, the cluster can be composed of, for example, a 64-kilobyte recording area or the like.

[0050]

As described above, the main track data and the low resolution data corresponding to the main track data are recorded on the optical disc 1. The main track data and the low resolution data are intermittently recorded in units of a predetermined amount of time, for example, 1.5 seconds to 2 seconds, of the original video data (video data before being encoded) or in units of a predetermined

amount of the original data.

[0051]

More specifically, assuming that a predetermined unit containing the main track data and the low resolution data for a predetermined period of time of the original video data or a predetermined amount of the original video data is referred to as a carton, the main track data and the low resolution data are recorded for each carton on the optical disc 1 as shown in Fig. 2. In consideration of data recording on the CLV system optical disc 1, high-speed playback (so-called shuttle playback), data concealment, eject time of the optical disc 1 and the like, it is appropriate that the main track data to be contained in each carton corresponds to, for example, 1.5 seconds to 2 seconds of the original video data, as described above.

[0052]

The carton is structured with, for example, as shown in Fig. 2, the low resolution data and the main track data corresponding to the low resolution data, which are consecutively arranged. Therefore, the contents of the low resolution video data obtained by decoding the low resolution data arranged in a carton are the same as those of the main track video data obtained by decoding the main track data except for their resolutions.

[0053]

Besides the video data, the main track data can contain audio data associated with the video data. If the main track data contains both the video data and the audio data, for example, as shown in Fig. 2, the video data for a predetermined amount of data or a

predetermined period of reproduction time, and the audio data associated with the video data are arranged in combination.

[0054]

As the video data contained in the main track data in this case, for example, video data at a bit rate of 25 Mbps (Mega bits per second), in which one GOP (Group of Pictures) is formed by 15 frames, can be used. As the audio data contained in the main track data in this case, for example, 4-channel audio data at a total bit rate of 3 Mbps, which is 16-bit quantized at a sampling rate of 48 kHz, can be used. Furthermore, as the low resolution data, for example, data obtained by JPEG-encoding video data of 256 by 192 pixels can be used.

[0055]

If the low resolution data is obtained by JPEG-encoding video data as described above, the low resolution decoder 5 shown in Fig. 1 is configured with a JPEG decoder for JPEG decoding.

[0056]

In addition to the low resolution data and the main track data, the time code of the video data, which is obtained by decoding the low resolution data and the main track data, and the meta data in which predetermined information is arranged, and the like can be contained in the carton. In the meta data, it is possible to arrange not only arbitrary information for a user but also a recording start position of the main track data in the carton and the information for the structure of GOP of the video data contained in the main track data. In the example shown in Fig. 2, the time code and the meta data

are arranged together with the low resolution data in the carton. More specifically, assuming that a combination of the low resolution data, the time code and the meta data is referred to as a tag, the tag is situated at the head of the carton (the position on the optical disc 1, which is first read out) followed by the main track data. Therefore, in a case where the carton recorded on the optical disc 1 is to be read out, the tag is first read out followed by the main track data.

[0057]

Assuming that a total bit rate of the meta data such as the time code as described above and the low resolution data is, for example, 2 Mbps, a bit rate of the data recorded on the optical disc 1 in units of carton shown in Fig. 2 is 30 (= 25 + 3 + 2) Mbps. Therefore, an optical disc having a recording rate of, for example, 35 Mbps or the like, which recording rate satisfactorily falls within the range of practical use, can be used as the optical disc 1. It is apparent that the disc drive 2 has performance of recording data at a recording rate of 35 Mbps or higher.

[0058]

The low resolution data is arranged at a different position on the optical disc 1 separately from corresponding main track data. In addition, the low resolution data has a sufficiently low bit rate and a small amount of data as compared with the main track data. Therefore, since the low resolution data can be verified (verified if it is correctly recorded or not) when it is recorded on the optical disc 1, the low resolution data can be recorded with high reliability as compared with

the main track data. The verification of the low resolution data will be described below with reference to Figs. 3 to 6.

[0059]

If the low resolution data is recorded, for example, after the video data is encoded by a fixed encoding method such as JPEG as described above, the contents recorded on the optical disc 1 can be easily confirmed regardless of the encoding method employed for the main track data. More specifically, in this case, a device capable of performing at least JPEG decoding can decode the low resolution data even if it cannot decode the main track data. Accordingly, the contents recorded on the optical disc 1 can be confirmed.

[0060]

As described above, since not only the main track data but also the low resolution data corresponding to the video data of the main track data but having a smaller amount of data are recorded on the optical disc 1, the low resolution data can be read out together with the main track data from the optical disc 1. Therefore, for example, if an error occurs in the main track data, error concealment can be performed by using the low resolution data so as to prevent real time playback from being interrupted. Moreover, in a case where only the main track data is read out from the optical disc 1, the low resolution data having a smaller amount of data is immediately read out so as to be played back even if, for example, the main track data fails to be read out to be too late for real time playback. As a result, the real time playback can be prevented from being interrupted.

[0061]

Furthermore, for example, in a case where high-speed playback (so-called shuttle playback) whose reproduction speed is higher than a normal reproduction speed is performed, the low resolution data which can be decoded within a shorter period of time is used instead of the main track data that requires longer time for decoding. As a result, the number of images, which can be displayed in the high-speed playback, that is, the amount of information provided for a user can be increased.

[0062]

As described above, the main track data may contain the audio data in addition to the video data in some cases. In this embodiment, however, the description of a process of the audio data is herein omitted for simplification of the description as appropriate. Although a pattern is described as containing the entire main track data in the carton, an actual pattern has a fluctuation; for example, the main track video data corresponding to the low resolution data is sometimes recorded in the precedent or subsequent carton. Moreover, in the recording pattern on the actual disc, the data are not arranged with regularity as shown in Fig. 2 in some cases due to redundant data for demodulation or for error correction or for convenience of cluster control.

[0063]

Next, the verification of the low resolution data, that is, the process for verifying if the low resolution data is correctly recorded in recording or not (hereinafter, also referred to as a verification process as appropriate) will be described with reference to Figs.

3 to 6.

[0064]

Fig. 3 shows an exemplary inner configuration of the PCI interface 3 for the verification process. The buffer 31 temporarily stores the low resolution data input from the low resolution encoder 17, which is to be recorded on the optical disc 1. A comparison section 32 compares the low resolution data stored in the buffer 31 and the low resolution data recorded on the optical disc 1 by the disc drive 2 so as to be immediately read out from the optical disc 1 by the disc drive 2 with each other to determine if they are identical with each other. If it is determined that these data are not identical with each other as a result of the comparison, the low resolution data stored in the buffer 31 is recorded on the optical disc 1 again.

[0065]

A procedure of the verification process is described with reference to a flowchart shown in Fig. 4. The verification process is executed each time the low resolution data is recorded on the optical disc 1.

[0066]

At a step S1, the PCI interface 3 stores the low resolution data, which is input from the low resolution encoder 17 so as to be recorded on the optical disc 1, in the buffer 31 while supplying the same low resolution data to the disc drive 2. The disc drive 2 records the low resolution data supplied from the PCI interface 3 on the optical disc 1.

[0067]

At a step S2, the system controller 10 determines

whether there is excessive time before a start of writing next main track data or not. If it is determined that there is no excessive time, that is, it is necessary to immediately write the next main track data, the verification process is terminated, expecting that the low resolution is recorded on the optical disc 1 without any abnormality.

[0068]

If it is determined that there is excessive time at the step S2, the process proceeds to a step S3. At the step S3, the disc drive 2 reads out the low resolution data written on the optical disc 1 by the process at the step S1 so as to supply it to the comparison section 32 of the PCI interface 3. At a step S4, the comparison section 32 reads out the low resolution data stored in the buffer 31 and then compares the readout data with the low resolution data supplied from the disc drive 2 in the process at the step S3 so as to determine whether they are identical with each other or not. If it is determined that these data are identical with each other, the verification process is terminated because it means that the low resolution data is recorded on the optical disc 1 without any abnormality.

[0069]

On the other hand, if it is determined that these data are not identical with each other at the step S4, the process proceeds to a step S5. At the step S5, the comparison section 3 determines whether or not the low resolution data has been determined as not being identical with the same low resolution data read out from the buffer 31 for successive two or more times in the

process at the step S4. If it is determined that the low resolution data has not been determined as not being identical for successive two or more times, the process returns to the step S1 so as to rewrite the same low resolution data on the optical disc 1. Then, the subsequent processes are repeated.

[0070]

If it is determined at the step S5 that the low resolution data has been determined as not being identical for successive two or more times due to the process at the step S4, the process proceeds to a step S6 because it is considered that a write error is caused by, for example, the presence of an area on the optical disc 1, on which data can be hardly recorded. At the step S6, the disc drive 2 moves the pickup 2A in a radial direction of the optical disc 1 so that subsequently recorded data is recorded on a recording area separate from the actual recording area on the optical disc 1. Thereafter, the process returns to the step S1 and the subsequent steps are repeated. The description of the procedure of the verification process has been made above.

[0071]

By moving the pickup 2A as in the process at the step S6 described above, the subsequent main track data can be prevented from being written in the area that may be partially present on the optical disc 1, on which data can be hardly recorded. As a result, the reliability in writing of the main track data can be improved.

[0072]

Fig. 5 shows a state where the above-described verification process is executed in a case where a

recording rate of the disc drive 2 on the optical disc 1 is not sufficiently high with respect to a bit rate of the data (the main track data, the low resolution data and the like) to be recorded on the optical disc 1. In the illustrated case, each of the low resolution data A and C is successfully written at the first writing, whereas the low resolution data B is written twice because the first writing is failed. It should be noted that, in this case, since it is necessary to record the next main track data immediately after the second writing of the low resolution data B, it is not certain if the low resolution data B is correctly written by the second writing.

[0073]

Fig. 6 shows a state where the above-described verification process is executed in a case where a recording rate of the disc drive 2 on the optical disc 1 is sufficiently high with respect to a bit rate of the data to be recorded on the optical disc 1. In the illustrated case, the low resolution data B is successfully written at the first writing, whereas the low resolution data A is successfully written at the third writing after the pickup 2A is moved because the first and second writings of the low resolution data A are failed.

[0074]

Next, a process of playing back a recorded video signal while encoding an input video signal so as to record it on the optical disc 1 (hereinafter, referred to as a time-shift playback process) will be described.

[0075]

As described above, the disc recording/reproducing device constituting the embodiment of the present invention encodes an input video signal at two types of resolution so that the resulting high bit-rate main track data and low bit-rate low resolution data are substantially simultaneously recorded on the optical disc 1. A bit rate of the carton containing the main track data and the low resolution data is 30 Mbps.

[0076]

If a recording rate of the disc drive 2 is about 35 Mbps, an input video signal for two seconds is recorded every two seconds. However, since the actual time required to record the carton corresponding to the video signal for two seconds is only 1.68 seconds, excessive 0.32 seconds are generated every two seconds.

[0077]

In this case, as shown in Fig. 7, a plurality of tags, each containing the low resolution data, are read out at a time so as to play back the readout low resolution data within excessive time generated by successively recording a plurality of cartons in the time-shift playback process. For example, five cartons corresponding to an input video signal for 10 seconds are successively recorded. Five tags are successively read out within the resulting excessive time of 1.6 (= 5 × 0.32) seconds so as to play back the low resolution data for 10 seconds of reproduction time.

[0078]

If a time difference between time of the video signal being recorded and reproduction time of a time-shift played back video signal (hereinafter, referred to

as trace time) is short, a recording position and a readout position are close to each other. Therefore, there arise few problems because the amount of movement of the pickup 2A for reading out the tag is small. In a case where the trace time is long, however, the recording position and the readout position are separate away from each other. Therefore, a moving distance of the pickup 2A for reading out the tag becomes long so that the movement of the pickup 2A takes longer time. Accordingly, if a unit of 5 tags is read out at a time as shown in Fig. 7, the trace time is limited to about 70 seconds so that the time-shift playback is continuously performed without any interruptions.

[0079]

Next, a case where a recording rate of the disc drive 2 is about 70 Mbps will be considered. Also in this case, an input video signal for two seconds is recorded every two seconds. However, since an actual amount of time required to record a carton corresponding to the video signal for two seconds is only 0.84 seconds, excessive time of 1.16 seconds is generated every two seconds.

[0080]

In this case, the tag containing the low resolution data is read out so as to play back the readout low resolution data in the time-shift playback within the excessive time of 1.16 seconds which is generated by recording one carton, as shown in Fig. 8. In a case where the excessive time is as long as 1.16 seconds as described above, there will be no problem if the amount of movement of the pickup 2A for reading out the tag

becomes large. Therefore, even without limiting the trace time, for example, even if the trace time is set to be 100 seconds, the time-shift playback can be continuously performed without any interruptions.

[0081]

Moreover, in a case where the excessive time is as long as 1.16 seconds as described above, only a small amount of movement of the pickup 2A is required to perform the readout if the trace time is short (for example, one second). Thus, the main track data may be read out so as to be played back instead of reading out the recorded tag. In such a case, an image provided for a user by the time-shift playback has high image quality.

[0082]

Although the tag is read out after completion of recording in units of carton in the above description, the tag may be read out in response to a direction of time-shift playback given by a user even if the recording in units of carton is in progress. In such a manner, the quick-responsibility to a user's operation can be enhanced.

[0083]

Two of the pickups 2A may be provided for the disc drive 2, and each of them may be read-only or read-only. As a result, in a case where the recording rate of the disc drive 2 is about 35 Mbps, it is no longer necessary to limit the trace time. In a case where the recording rate of the disc drive 2 is about 70 Mbps, the time-shift playback using the main track data can be constantly performed regardless of the trace time.

[0084]

Next, a process of recording input video data on the optical disc 1 while externally transmitting the recorded video data through, for example, a LAN (Local Area Network) (hereinafter, this process is referred to as an upload process) will be described.

[0085]

The upload process is in common with the above-described time-shift playback process in that the low resolution data is read out from the optical disc 1 within the excessive time generated after each recording of the carton containing the main track data and the low resolution data on the optical disc 1. In the time-shift playback process, however, the readout low resolution data is played back at single speed, that is, the readout low resolution data is processed at a constant speed. On the other hand, in the upload process, the read out low resolution data is communicated through a predetermined network or the like. Therefore, unlike the time-shift playback process, the amount of time required to transmit a fixed amount of low resolution data is not necessarily fixed, depending on the busyness or congestion of the network and the like.

[0086]

Fig. 9 shows an exemplary inner configuration of the PCI interface 3 for the upload process. The buffer 31 is used to temporarily store the low resolution data input from the low resolution encoder 17 so as to be recorded on the optical disc 1; and to store the low resolution data read out from the optical disc 1 by the disc drive 2 so as be transmitted by the transmission section 18. In the upload process, if the low resolution data to be

transmitted is present in the buffer 31 for recording, the low resolution data is read out so as to be transmitted. On the other hand, if the low resolution data to be transmitted is not present in the buffer 31, the low resolution data to be transmitted is read out from the optical disc 1 so as to be stored in the buffer 31. Then, the low resolution data is read out so as to be transmitted.

[0087]

Fig. 10 shows an example of the upload process, assuming that three low resolution data are successively read out from the optical disc 1 for each time.

[0088]

In the illustrated case, since the 0th to third low resolution data to be transmitted are present in the buffer 31 at the time of transmission, these low resolution data are not read out from the optical disc 1 whereas the low resolution data present in the buffer 31 are transmitted. However, since a transmission speed of these low resolution data is low due to a status of the network or the like, the fourth low resolution data is no longer present in the buffer 31 when the fourth low resolution data is to be transmitted whereas the eighth to tenth low resolution data are stored therein. Accordingly, the fourth to sixth low resolution data are read out from the optical disc 1 to be stored in the buffer 31 for the transmission.

[0089]

It should be noted that if a transmission speed of the fourth and subsequent low resolution data is improved, up to the seventh low resolution data are read out from

the optical disc 1. For the eighth and subsequent low resolution data, however, the readout of these low resolution data from the optical disc 1 is omitted because the low resolution data stored in the buffer 31 for recording still remain at the time of transmission. Therefore, the low resolution data stored in the buffer 31 are used for transmission.

[0090]

The upload process is realized by executing in parallel a writing process of writing the low resolution data on the optical disc 1 and a transmission process of externally transmitting the low resolution data. First, one of these processes, that is, the writing process will be described with reference to a flowchart shown in Fig. 11.

[0091]

At a step S11, the PCI interface 3 sets an invalid value -1 to a register reg[], which indicates a carton number of data stored in the buffer 31 in the arrangement of the same size as that of the buffer 31, so as to clear the register. The PCI interface 3 sets a frequency limit value mf0 to a counter mf for limiting a readout frequency. Herein, the frequency limit value mf0 may be automatically set in accordance with a communication speed as shown in Fig. 15 or may be arbitrarily set by a user.

[0092]

Moreover, at the step S11, the PCI interface 3 sets kr indicating a carton number of the last written data to $+\infty$ and kw indicating the last readout data to 0.

[0093]

At a step S12, the PCI interface 3 waits until data for one carton is stored in the buffer 31. In a case where the data for one carton is stored in the buffer 31, the process proceeds to a step S13. At the step S13, the PCI interface 3 outputs the data for one carton stored in the buffer 31 to the disc drive 2. The disc drive 2 records the input data for one carton to the optical disc 1.

[0094]

At a step S14, the PCI interface 3 determines whether the data for one carton which is stored in the buffer 31 is used shortly or not. If it is determined that the data is used shortly, the data for one carton is not erased but kept in the buffer 31. The process at the step S14 will be described with reference to a flowchart shown in Fig. 12.

[0095]

At a step 21, it is determined whether data, which is different from that previously written on the optical disc 1 and being still stored in the buffer 31, is read out or not. If it is determined that the different data is read out, the data stored in the buffer 31 is abandoned. Then, the process returns to a step S15 in Fig. 11.

[0096]

If it is determined that the data different from the data stored in the buffer 31 is not read out at the step S21, the process proceeds to a step S22. At the step S22, it is determined whether the data still stored in the buffer 31 is read out or not. If it is determined that the data is read out, the process proceeds to a step S23.

At the step S23, it is determined whether a conditional expression: kt < kw < kt + 10 is satisfied or not. If it is determined that the conditional expression is satisfied, the process returns to the step S15 in Fig. 11. It should be noted that, in this conditional expression, kt is a carton number of the data being transmitted.

[0097]

If it is determined that the conditional expression: kt < kw < kt + 10 is not satisfied at the step S23, the process proceeds to a step S24. At the step S24, the data still stored in the buffer 31 is further kept in the buffer 31, and kw is set to the register reg [kw%10]. The process returns to the step S15 in Fig. 11.

[0098]

At the step S15 in Fig. 11, the PCI interface 3 increments the count mf by 1. At a subsequent step S16, the PCI interface 3 determines whether the buffer 31 is void or not. After the determination, the process proceeds to a step S17. At the step S17, the data is duly read out from the optical disc 1. A process at the step S17 is described with reference to a flowchart shown in Fig. 13.

[0099]

At a step S31, it is determined whether all conditional expressions: kr - kt < kr0, kt > kw - dt0, and mf > mf0 are satisfied or not. In these conditional expressions, kr0 is a value of an exhaustion limit of the buffer 31. This value may be automatically set in accordance with a communication speed or may be arbitrarily set by a user as shown in Fig. 15. Moreover, dt0 is a set value of the trace time.

[0100]

If it is determined that even one of the conditional expressions is not satisfied, the process returns to a step S18 in Fig. 11. If it is determined that all the conditional expressions are satisfied, the process proceeds to a step S32. At the step S32, it is determined whether an image reproduction mode is set (pb = ture) or not and whether the trace time is equal to or lower than the limit value dt0 or not. At a step S33, if it is determined that a desired carton is not yet written (that is, data to be read out is not yet recorded) or there is data being used or unused, the process returns to the step S18 in Fig. 11. If it is determined that the desired carton is not unwritten and there is no data being used or unused, the process proceeds to a step S34.

[0101]

At the step S34, it is determined whether the data to be read out from the optical disc 1 is stored in the buffer 31 or not. If it is determined that the data is stored in the buffer 31, the following processes at steps S35 and S36 are skipped. If it is determined that the data is not stored in the buffer 31, the process proceeds to the step S35. At the step S35, data for one carton is read out. However, if f = 0 is established, only the tag is read out. At the step S36, the counter mf is reset to 0. At a step S37, the register reg [k%10] is reset to kr (= K). The counter mf is reset to 0.

[0102]

If the number of times repeating the processes at the steps S33 to S38 is smaller than cr0 at a step S38, the process returns to the step S33 so as to repeat the

subsequent processes. If the number of times repeating the processes at the steps S33 to S38 reaches cr0, the process returns to the step S18 in Fig. 11.

[0103]

At a step S18 in Fig. 11, the PCI interface 3 determines whether the data for one carton is stored in the buffer 31 or not. If it is determined that the data for one carton is not stored therein, the process returns to the step S13 so as to repeat the subsequent processes. If it is determined that the data for one carton is stored therein at the step S18, the process proceeds to a step S19 where the verification process is executed if there is any excessive time. Thereafter, the process returns to the step S12 so as to repeat the subsequent processes. The writing process, which corresponds to one of the processes for realizing the upload process, has been described.

[0104]

Next, the transmission process, which corresponds to the other one of the processes for realizing the upload process, will be described with reference to a flowchart shown in Fig. 14. At a step S41, the PCI interface 3 sets kt indicating a carton number of the low resolution data being transmitted to target -1 while setting the last readout carton number kr to kt. At a step S42, the PCI interface 3 determines that two conditions, that is, data is being written and the same data is being read out, are satisfied or not. If it is determined that any one of the conditions is not satisfied, the process proceeds to a step S43 where the register reg [] is all cleared (an invalid value -1 is set). If it is determined at a

step S42 that both of the conditions are satisfied, the process proceeds to a step S44 where the register reg [] is refreshed (if a value other than kt + 1 to kt + 10 is set, the set value is replaced by 0).

[0105]

At a step S45, the PCI interface 3 waits until a conditional expression: kt < kr is satisfied. If it is determined that the conditional expression is satisfied, the process proceeds to a step S46. At the step S46, the PCI interface 3 increments kt by 1. At a step S47, the PCI interface 3 supplies the low resolution data having the current number of kt to the transmission section 18. The transmission section 18 transmits the supplied low resolution data having the current number of kt. Thereafter, the process returns to the step S45 so as to repeat the subsequent processes. The transmission process, which corresponds to the other one of the processes for realizing the upload process, has been described.

[0106]

Next, a process in high-speed playback (so-called shuttle playback) of playing back data at a higher speed than a normal reproduction speed (single speed) will be described with reference to Figs. 16 to 21.

[0107]

Fig. 16 shows high-speed playback performed by a conventional DVD player or the like. In the conventional case, it is common to instantaneously increase reproduction speed from single speed to display images while skipping some images in a similar way to show picture cards in the high-speed play back; that is, a set

of the number of images corresponding to the reproduction speed are extracted so as to be displayed as stationary images for each certain period of time.

[0108]

On the other hand, in the disc recording/reproducing device according to this embodiment, the main track data is played back in normal playback, whereas the low resolution data is played back in high-speed playback. Instead of instantaneously changing the reproduction speed in the high-speed playback, the reproduction speed is gradually changed at a constant acceleration as shown in Fig. 17. The accelerated reproduction speed is calculated in a predetermined period. In a state where the reproduction speed is n-x speed, a screen is horizontally divided into n. The areas obtained by the division are made to partially display different frames of the low resolution data, respectively, so as to allow a user to intuitively know the current reproduction speed.

[0109]

The description will be made more specifically. If high-speed playback (for example, 8-x speed playback) is directed in a state of normal playback where the main track data is displayed on a screen, the reproduction speed gradually changes from single speed to 8-x speed. When the reproduction speed reaches double speed, for example, the screen is horizontally divided in two. Two different frames of the low resolution data are partially displayed in the respective areas obtained by the division. Similarly, for example, when the reproduction speed reaches triple speed, the screen is horizontally divided in three. Three different frames of the low

resolution data are partially displayed in the respective areas obtained by the division. When the reproduction speed ultimately reaches 8-x speed, the screen is horizontally divided into eight. Eight different frames of the low resolution data are partially displayed in the respective areas obtained by the division.

[0110]

It should be noted that if normal playback is directed by a user while the high-speed playback is in progress, the reproduction speed of the high-speed playback using the low resolution data is gradually lowered to single speed at a constant acceleration in the reverse manner to that described above, thereby switching the reproduction mode to single-speed playback of the main track data. For example, Fig. 18 shows a state where a reproduction mode returns from 8-x high-speed playback to normal playback.

[0111]

In 8-x high-speed playback, the screen is horizontally divided into 8. Eight different frames of the low resolution data are partially displayed in the respective eight areas obtained by the division. If normal playback is directed by a user in this state, the reproduction speed is gradually lowered at a constant deceleration, corresponding to the acceleration, to 7-x speed, 6-x speed, 5-x speed, 4-x speed, triple speed, double speed and single speed. Meanwhile, for example, when the reproduction speed is lowered to 5-x speed, the screen is horizontally divided into 5. Five different frames of the low resolution data are partially displayed in the respective areas obtained by the division.

Similarly, for example, at a stage where the reproduction speed is lowered to double speed, the screen is horizontally divided into two and two different frames of the low resolution data are partially displayed in the respective areas obtained by the division.

[0112]

However, in a case where the reproduction speed being accelerated is calculated in a predetermined period in the high-speed playback, the calculated reproduction speed being accelerated sometimes includes a decimal fraction, depending on the predetermined period or a value of the acceleration. In such a case, the division of the display screen will be more complicated. Such a case will be described with reference to Fig. 19.

[0113]

For example, Fig. 19 shows an example where high-speed playback at 4-x speed is performed where a period for calculating the reproduction speed being accelerated is set to a time period allowing a frame to be switched in normal playback (in a case of NTSC, 1/30 seconds), a reproduction speed v is 1 at timing t = 0, and an acceleration of the reproduction speed is 0.4 frames for each of the periods.

[0114]

In this case, at the timing t = 0, 1, 2, 3,...,8, the reproduction speed v is calculated as 1, 1.4, 1.8, 2.2, ..., 4.2.

[0115]

At the timing t = 0, the 0th frame is displayed on the screen.

[0116]

At the timing t = 1, a part of the first frame is displayed in an area having a height of 0.714 (= 1/1.4) obtained by division, where the total height of the screen is 1. In an area therebelow, a part of the second frame is displayed.

[0117]

At the timing t = 2, a part of the third frame is displayed in an area having a height of 0.556 (= 1/1.8) obtained by division, where the total height of the screen is 1. A part of the second frame is displayed in an area thereabove having a height obtained by: 0.6 × the height 0.556, where 0.6 corresponds to a fraction of the moving distance 1 = 2.4 with respect to 3, whereas a part of the fourth frame is displayed in an area therebelow.

[0118]

At the timing t = 3, a part of the fifth frame is displayed in an area having a height of 0.455 (= 1 /2.2) obtained by division, where the total height of the screen is 1. A part of the fourth frame is displayed in an area thereabove having a height obtained by 0.8 × the height 0.455, where 0.8 corresponds to a fraction of the moving distance 1 = 4.2 with respect to 5, whereas a part of the sixth frame is displayed in an area therebelow.

[0119]

At the timing t = 4, a part of the seventh frame is displayed in an area having a height of 0.385 (= 1 /2.6) obtained by division, where the total height of the screen is 1. A part of the sixth frame is displayed in an area thereabove having a height obtained by 0.6 × the height 0.385, where 0.6 corresponds to a fraction of the moving distance 1 = 6.4 with respect to 7, whereas a part

of the eighth frame is displayed in an area therebelow.

[0120]

For the following timings, the screen display is performed in a similar manner in accordance with the reproduction speed being accelerated.

[0121]

At the timing t = 8, the reproduction speed reaches a target speed. At this time, an odd display area is generated by the division of the screen as shown in Fig. 20 on the left. If the high-speed playback is continued while such an odd display area is being present, the appearance is degraded. In addition, the process for display becomes troublesome. Therefore, as shown in Fig. 20 on the right, the division of the screen is adjusted so as not to generate any odd areas. In the illustrated case, the screen is horizontally divided into four for display.

[0122]

On the contrary, in a case where the reproduction speed is lowered to single speed, for example, in response to a direction of normal playback by a user, from a state where the division of the screen is adjusted so as not to generate any odd areas as shown in Fig. 20 on the right, the adjustment is cancelled at the start of deceleration, as shown in Fig. 21. In this manner, the appearance can be prevented from being degraded as compared with a case where the adjustment is not cancelled at the start of deceleration but the adjustment is performed again for an odd area, which is generated by the division of the screen when the reproduction speed returns to single speed.

[0123]

The above-described procedure of the high-speed playback is summarized as shown in a flowchart of Fig. 22. At a step S51, the system controller 10 sets a target speed (for example, 4-x speed or the like) in the high-speed playback in response to the manipulation of the remote commander 21 by a user. Then, the system controller 10 starts counting time after initializing the timing t shown in Fig. 19 to 0 while initializing various parameters v, l and the like.

[0124]

At a step S52, the system controller 10 calculates various parameters (a reproduction speed v, a moving distance l, a height of an area obtained by horizontally dividing a screen, and the like) corresponding to the timing t. The system controller 10 outputs the height of the area obtained by horizontally dividing the screen to the OSD section 8 so as to direct the generation of the screen for the high-speed playback. At a step S53, in response to the direction from the system controller 10, the OSD section 8 generates video data whose different frames are partially displayed in the areas obtained by horizontally dividing the screen in accordance with the reproduction speed, and then outputs the video data to the later stage.

[0125]

At a step S54, the system controller 10 determines whether the reproduction speed v calculated in the process at the step S52 has reached the target speed set in the process at the step S51 or not. If it is determined that the calculated reproduction speed v has

not reached the target speed, the process returns to the step S52 so as to repeat the subsequent processes.

[0126]

Then, at the step S54, if it is determined that the reproduction speed v calculated in the process at the step S52 has reached the target speed set in the process at the step S51, the process proceeds to a step S55. At the step S55, in response to the direction from the system controller 10, the OSD section 8 adjusts an odd area present in the video data generated by the process at the step S53 so as to output the video data to the later stage.

[0127]

Thereafter, the process returns to the step S53 so as to repeat the subsequent processes until the termination of the high-speed playback is directed. The high-speed playback process has been described above.

[0128]

It should be noted that, although the reproduction of video data has been described in the above embodiment, the present invention is also applicable to, for example, reproduction of audio data.

[0129]

In addition, although the low resolution data obtained by degrading the resolution of the main track data is used as the low resolution data in the above embodiment, it is also possible to use low resolution data obtained by, for example, reducing the number of bits allocated to pixels constituting the main track data as the low resolution data.

[0130]

Furthermore, although the JPEG system is used as the encoding method used for the low resolution data in the above embodiment, the encoding method used for the low resolution data is not limited to the JPEG method.

[0131]

In addition, although the MPEG system is used as the encode method for the main track data in the above embodiment, the encoding method used for the main track data is not limited to the MPEG system.

[0132]

In addition, although the encoded video data are used for both the low resolution data and the main track data in the above embodiment, the video data without being encoded can be used as the low resolution data and the main track data.

[0133]

In addition, although the length of the carton is set to about 2 seconds in the above embodiment, the length of the carton is not limited thereto. For example, by reducing the length of the carton, a track jump from the low resolution data to the main track data can be reduced or omitted so as to further improve the response. On the other hand, by increasing the length of the carton, it becomes easy to read out the low resolution data in advance for storage. In this case, since it is not necessary to read out the low resolution data at each start of reproduction, the response can be further improved.

[0134]

Incidentally, a series of the above-described processes may be executed by hardware or by software. In

a case where the series of the processes are executed by software, the software is installed from a recording medium to a computer, in which a program constituting the software is incorporated into dedicated hardware, or, for example, to a general-propose personal computer capable of executing various functions by installation of various programs.

[0135]

It should be noted that, throughout the specification, the steps describing the program recorded on a recording medium include not only the processes performed in time series in accordance with the described order but also the processes executed in parallel or individually without being necessarily processed in time series.

[0136]

In addition, throughout the specification, the system means the entire device configured with a plurality of devices.

[0137]

[Effect of the Invention]

As described above, according to the present invention, high bit-rate data and low bit-rate data for the same material are substantially simultaneously recorded in time division. The recorded low bit-rate data can be transmitted in parallel with the recording of the data.

[0138]

Moreover, collective readout of a certain amount of data reduces the number of seeks to improve efficiency. As a result, the data can be read out even during the

recording.

[0139]

If only the low resolution data having a small amount of data is read out, the data readout is possible even if excessive time during the recording is small and even by a constant linear velocity (CLV) method whose readout speed is lowered. Therefore, the recorded data is externally transmitted during the recording so as to be used for scripting or proxy-edit. Furthermore, it is not necessary to increase the number of revolutions of the disc for readout, uncomfortable noises or power consumption can be held down.

[0140]

Since data just recorded and data readout later are used in the same form, a transmission process for these data is facilitated. Moreover, since these data can be verified in a common manner, a circuit can be simplified.

[0141]

Data to be recorded is buffered in accordance with the needs. Therefore, it is not necessary to read out the data from the optical disc in a case of high-speed communication. Since the data is read out from the optical disc in a case of temporary low-speed communication, the data is not missing. On the other hand, even the low resolution data at a low bit rate is transmitted at a transmission speed less than single speed in many cases. Accordingly, time saving is achieved if the transmission is started simultaneously with the start of recording. The same principal is applied even when the recording is not performed. Therefore, for example, when the recording is terminated

during the transmission, it is not necessary to interrupt the transmission. Furthermore, even if the recording is restarted in such a state, the transmission can be continued in the same manner.

[0142]

Since parameters for readout can be selected in accordance with the type of a transmission line for transmission, useless readout or frequent readout can be prevented so as to hold down noises and power consumption.

[Brief Description of the Drawings]

[Fig. 1] A block diagram showing an exemplary configuration of a disc recording/reproducing device with the application of the present invention;

[Fig. 2] A diagram showing an example of a recording format of an optical disc;

[Fig. 3] A block diagram showing an exemplary configuration of a PCI interface for a verification process;

[Fig. 4] A flowchart for illustrating the verification process;

[Fig. 5] A diagram showing an example of the verification process in a case where a recording rate of a disc drive is single speed;

[Fig. 6] A diagram showing an example of the verification process in a case where a recording rate of the disc drive is double speed;

[Fig. 7] A diagram showing an example of time-shift playback in a case where a recording rate of the disc drive is single speed;

[Fig. 8] A diagram showing an example of time-shift playback in a case where a recording rate of the disc

drive is double speed;

[Fig. 9] A block diagram showing an exemplary configuration of a PCI interface for an upload process;

[Fig. 10] A diagram showing an example of the upload process;

[Fig. 11] A flowchart for describing a writing process for realizing the upload process in combination with a transmission process;

[Fig. 12] A flowchart for describing a data storage process at a step S14 in Fig. 11;

[Fig. 13] A flowchart for describing a data readout process at a step S17 in Fig. 11;

[Fig. 14] A flowchart for describing the transmission process for realizing the upload process in combination with the writing process;

[Fig. 15] A diagram for describing set values of frequency limit and exhaustion limit in the upload process;

[Fig. 16] A diagram for schematically describing an outline of high-speed playback by a conventional DVD player or the like;

[Fig. 17] A diagram for schematically describing an outline of high-speed playback by the disc recording/reproducing device according to the embodiment of the present invention;

[Fig. 18] A diagram for schematically describing an outline of a process at the transition from high-speed playback to normal-speed playback;

[Fig. 19] A diagram for schematically describing a horizontal division of a screen in high-speed playback;

[Fig. 20] A diagram showing an example of adjustment

of the division of the screen when the reproduction speed reaches a target reproduction speed in high-speed playback;

[Fig. 21] A diagram showing an example of adjustment of the division of the screen when a reproduction mode returns from high-speed playback to normal-speed playback; and

[Fig. 22] A flowchart for describing a high-speed playback process.

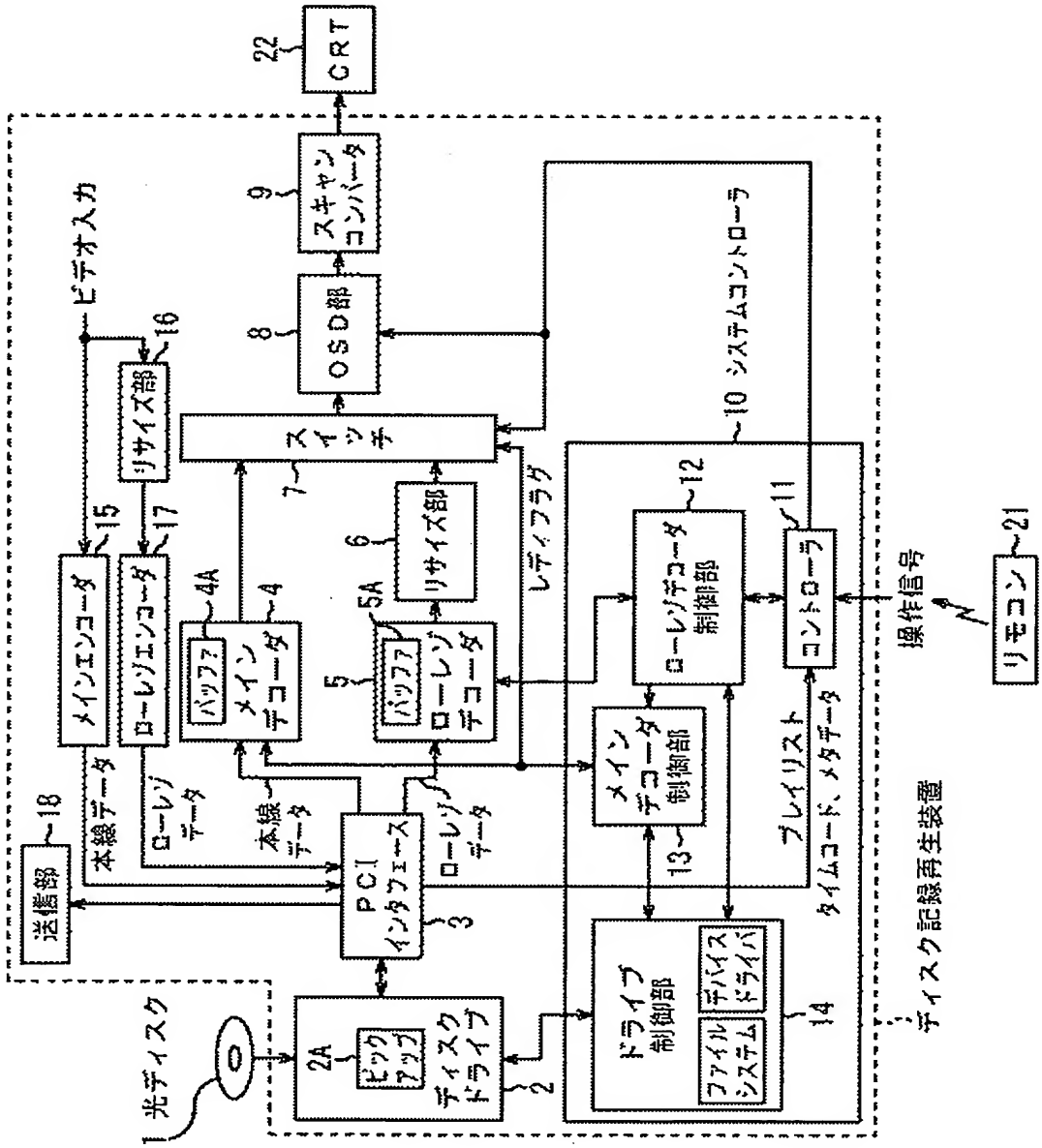
[Description of Reference Numerals]

1 optical disc, 2 disc drive, 3 PCI interface, 10 system controller, 4 main decoder, 5 low resolution decoder, 8 OSD section, 15 main encoder, 17 low resolution encoder

【書類名】図面

【図１】

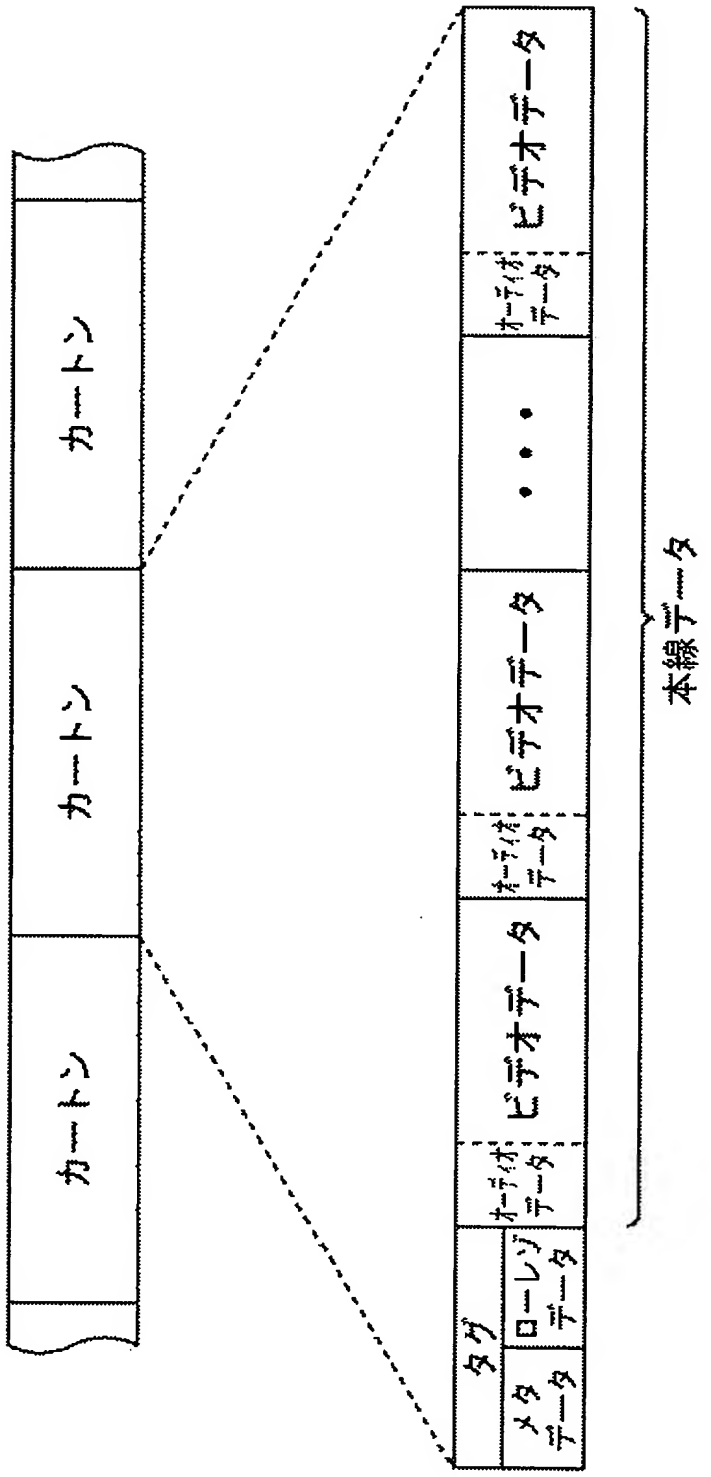
図1


1 光ディスク
2A ピックアップ
ディスクドライブ 2
PCI インタフェース 3
ローレゾデータ
本線データ
ローレゾデータ
送信部 18
本線データ
ローレゾデータ
メインエンコーダ 15
ローレゾエンコーダ 17
ビデオ入力
リサイズ部 16
バッファ
メインデコーダ 4A 4
バッファ
ローレゾデコーダ 5A 5
リサイズ部 6
スイッチ 7
OSD部 8
スキャンコンバータ 9
CRT 22
レディフラグ
メインデコーダ制御部 13
ローレゾデコーダ制御部 12
システムコントローラ 10
コントローラ 11
プレイリスト
タイムコード、メタデータ
ドライブ制御部 14
ファイルシステム
デバイスドライバ
ディスク記録再生装置 1
操作信号
リモコン 21

5

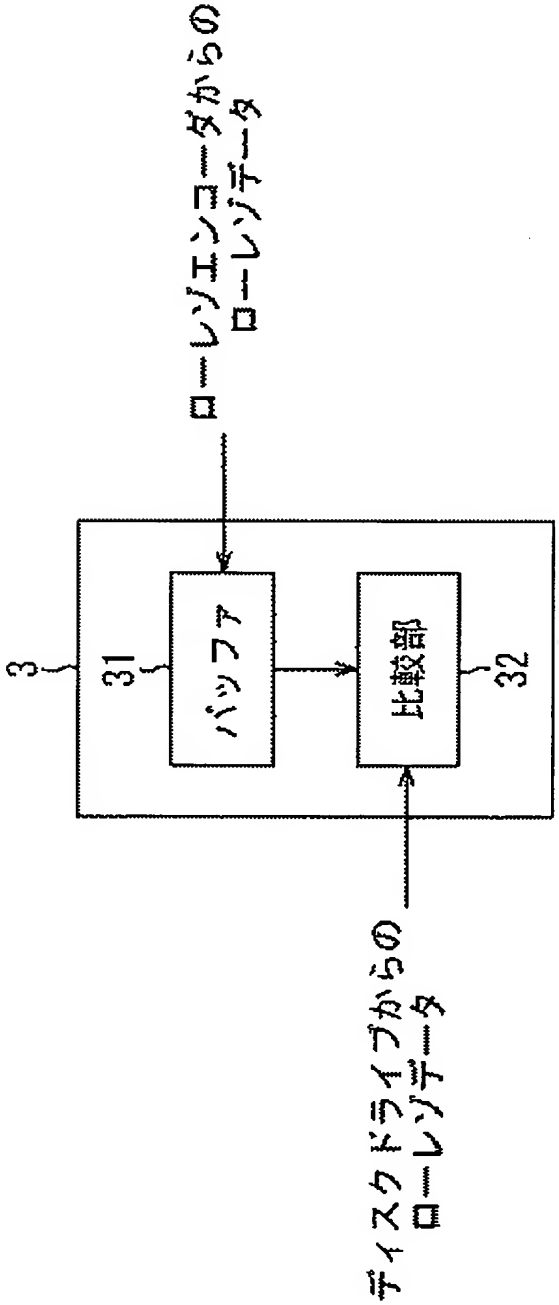
【図２】

図2


カートン
カートン
カートン
タグ
メタデータ
ローレゾデータ
オーディオデータ
ビデオデータ
オーディオデータ
ビデオデータ
・・・
オーディオデータ
ビデオデータ
本線データ

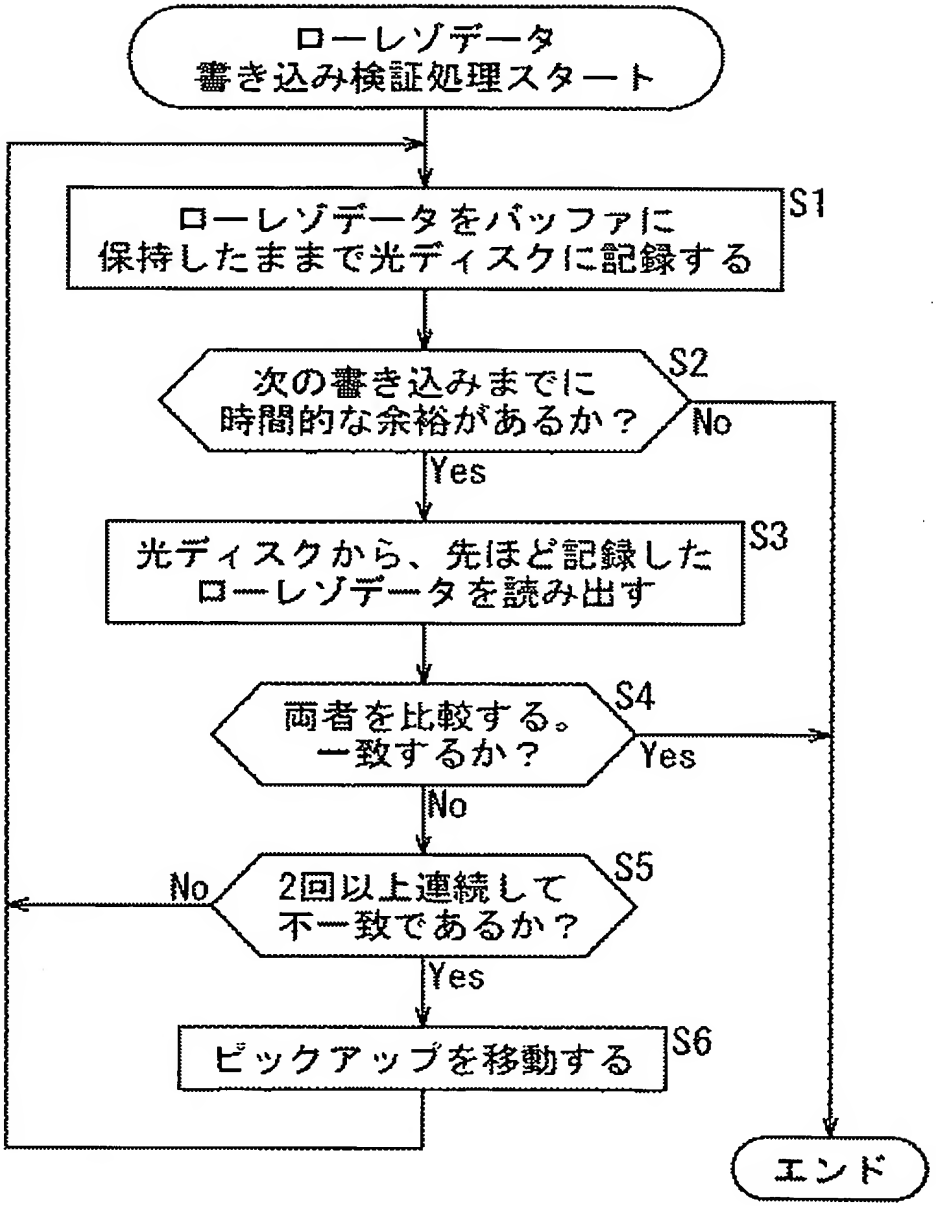
【図３】

図3



【図４】

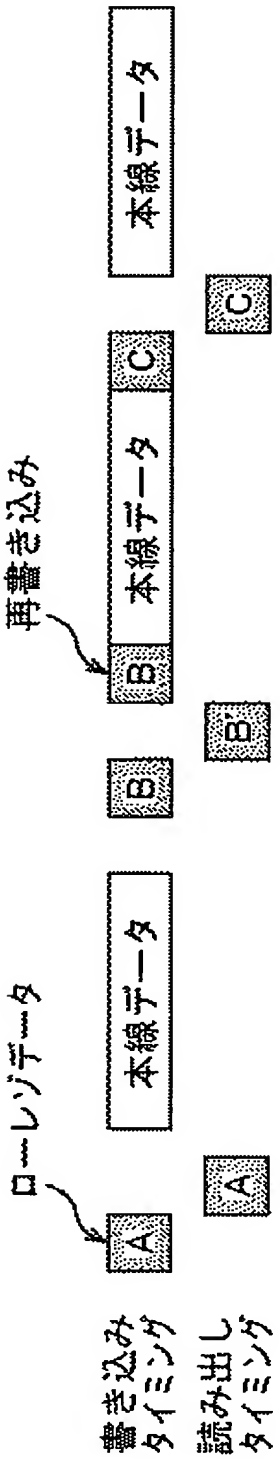
図4


ローレゾデータ
書き込み検証処理スタート
ローレゾデータをバッファに
保持したままで光ディスクに記録する
S1
次の書き込みまでに
時間的な余裕があるか？
S2
No
Yes
光ディスクから、先ほど記録した
ローレゾデータを読み出す
S3
両者を比較する。
一致するか？
S4
Yes
No
2回以上連続して
不一致であるか？
S5
No
Yes
ピックアップを移動する
S6
エンド

5

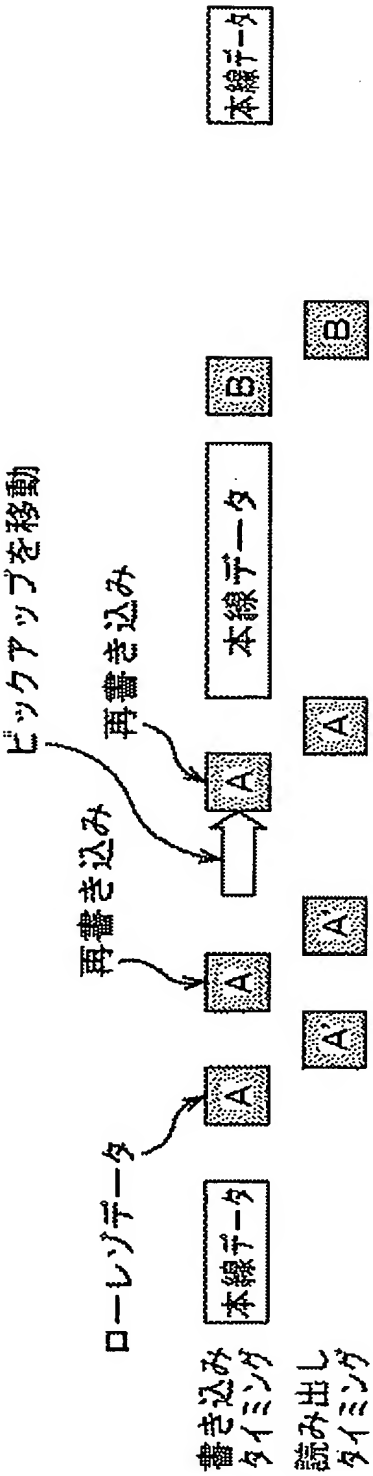
【図５】

図5


ローレジデータ
本線データ
再書き込み
本線データ
本線データ
A
B
B
C
A'
B'
C'
書き込みタイミング
読み出しタイミング

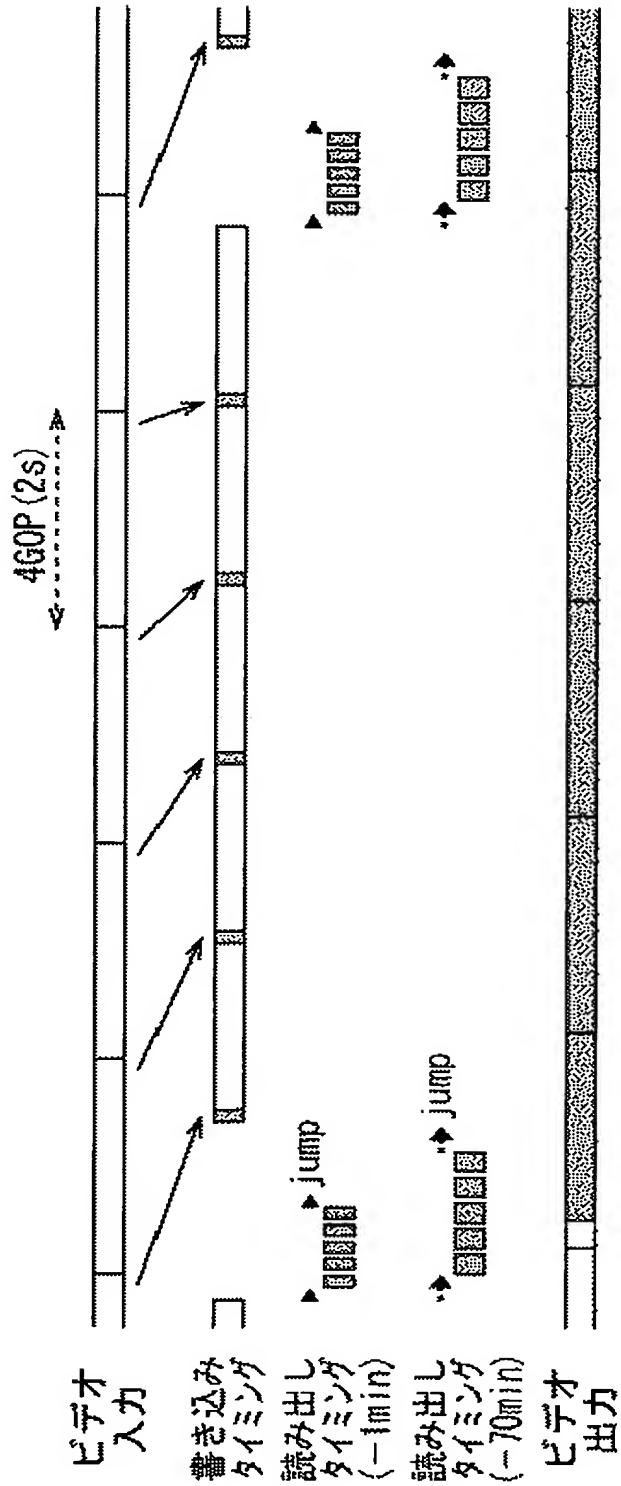
【図６】

図6


書き込み
タイミング
読み出し
タイミング
本線データ
A
A'
A'
A
A'
A
本線データ
B
B
本線データ
ローレゾデータ
再書き込み
再書き込み
ピックアップを移動

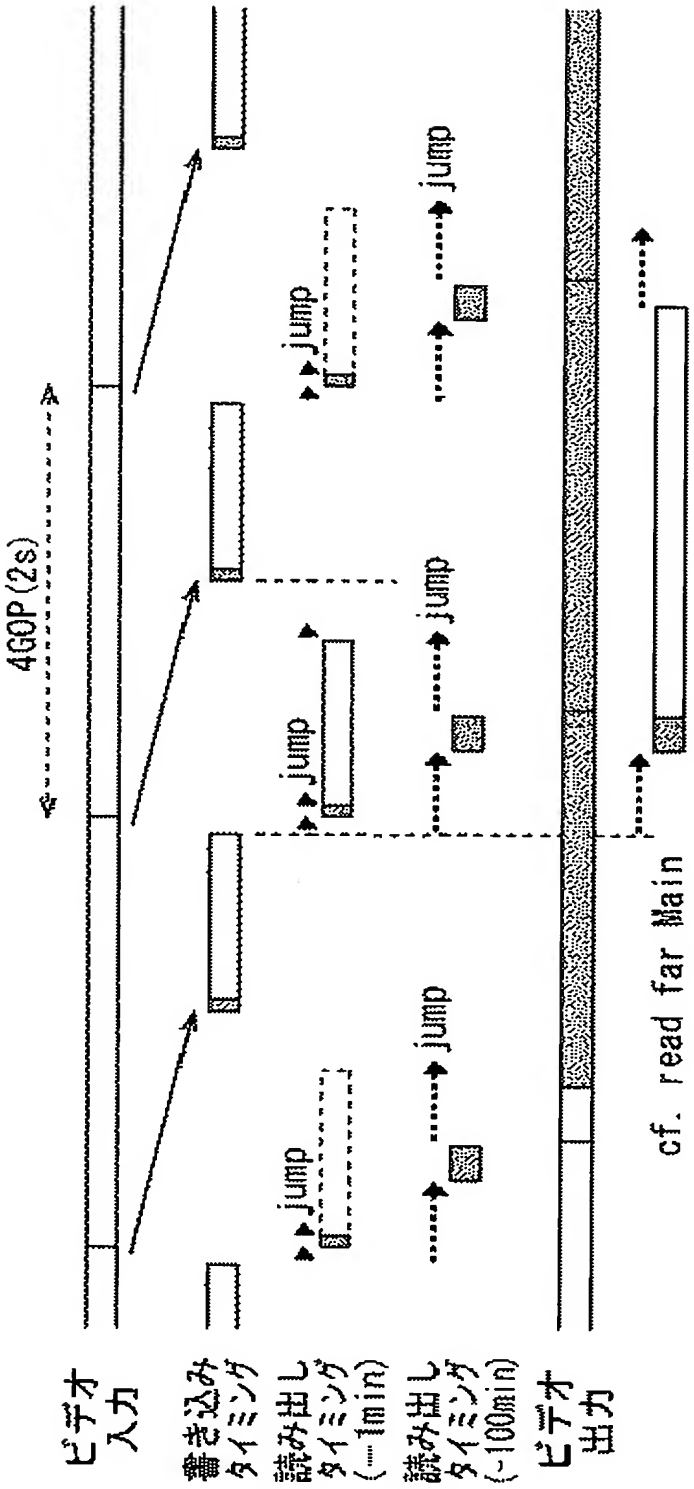
【図７】

図7


4GOP (2s)
jump
jump
ビデオ
入力
書き込み
タイミング
読み出し
タイミング
(−1min)
読み出し
タイミング
(−70min)
ビデオ
出力

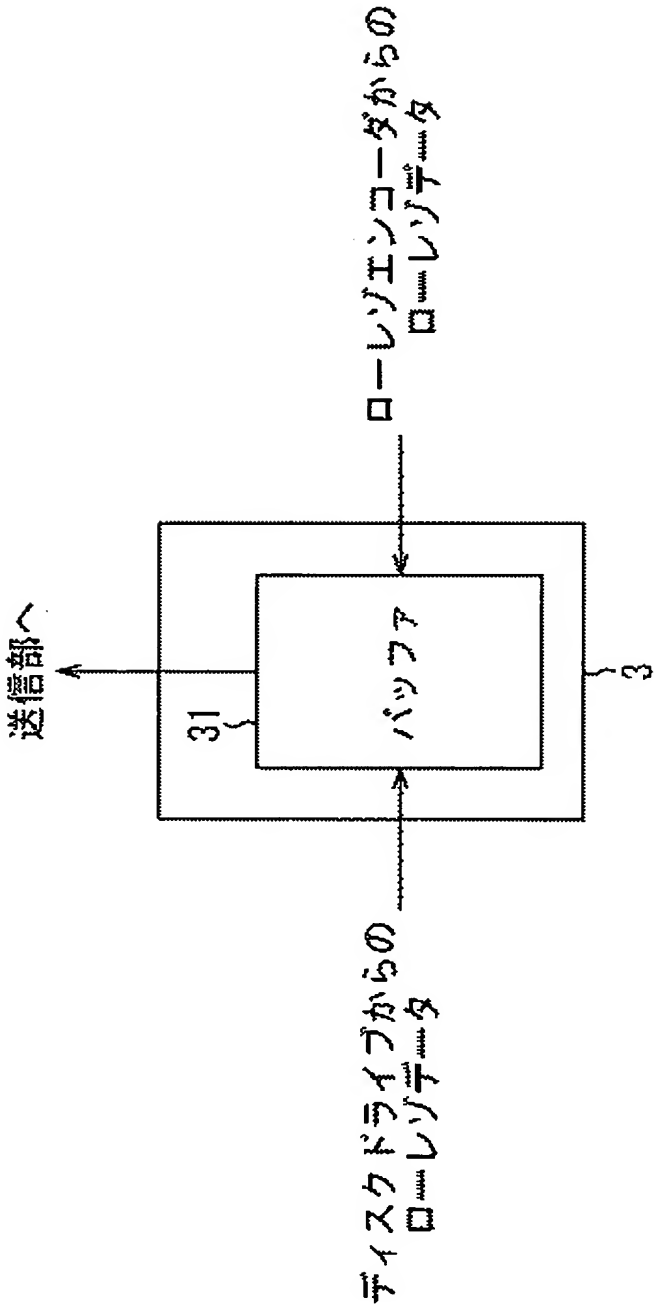
【図８】

図8


ビデオ
入力
書き込み
タイミング
読み出し
タイミング
(~1min)
読み出し
タイミング
(~100min)
ビデオ
出力
4GOP(2s)
jump
jump
jump
jump
jump
cf. read far Main

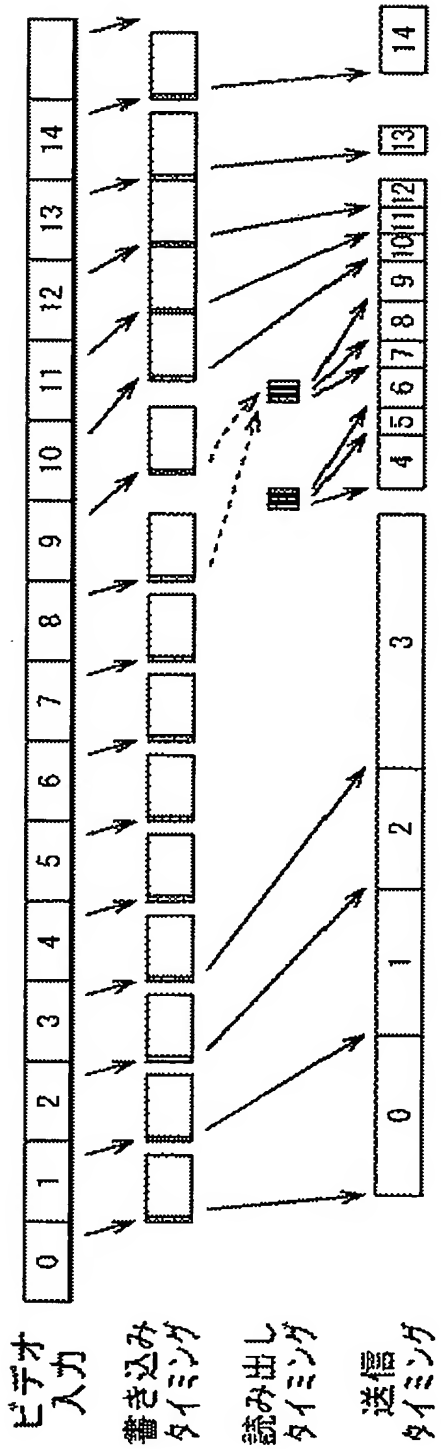
【図９】

図9



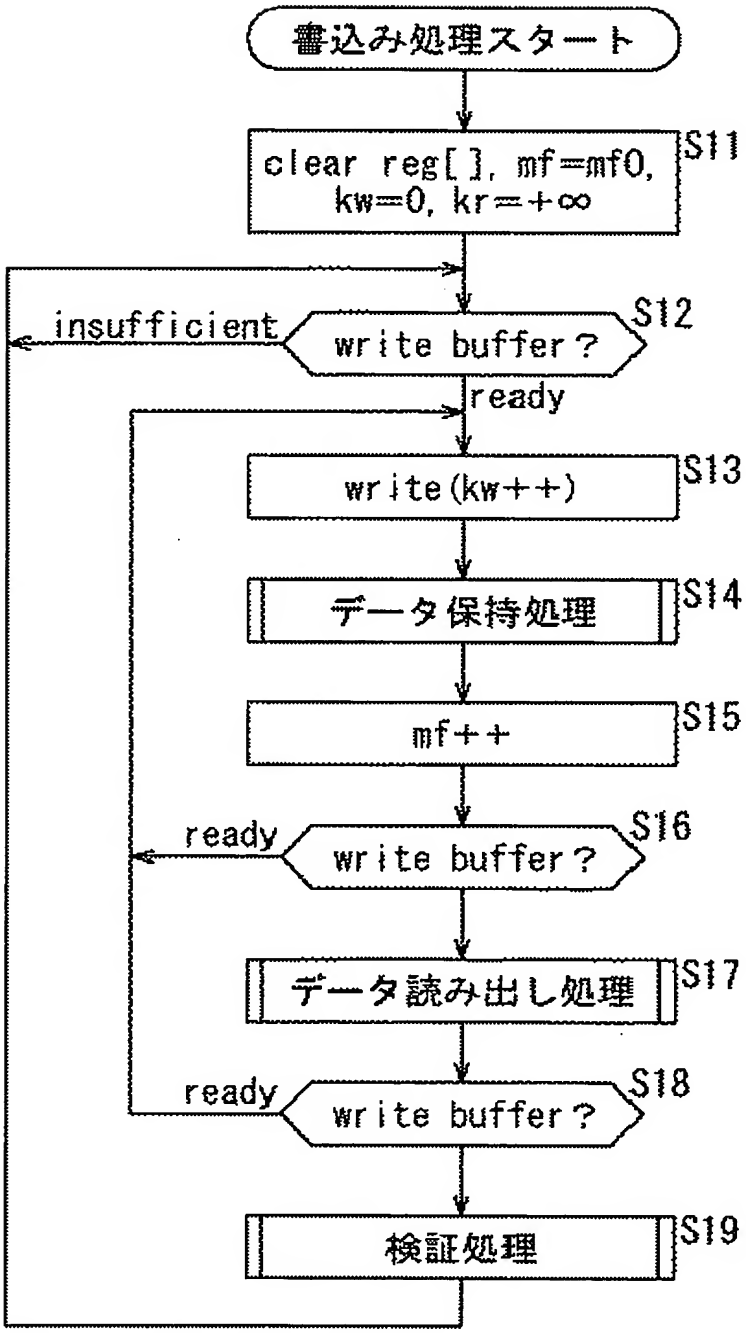
【図１０】

図10


0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
ビデオ入力
書き込みタイミング
読み出しタイミング
送信タイミング

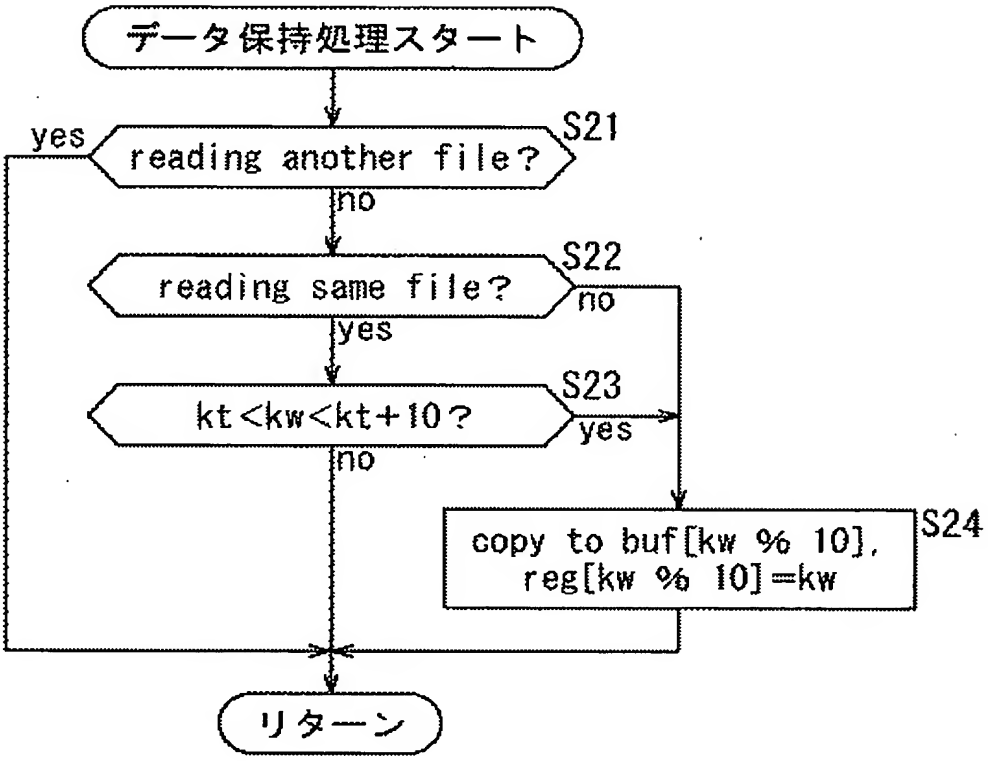
【図１１】

図11


書込み処理スタート
clear reg[], mf=mf0, kw=0, kr=+∞
S11
insufficient
write buffer？
S12
ready
write(kw++)
S13
データ保持処理
S14
mf++
S15
ready
write buffer？
S16
データ読み出し処理
S17
ready
write buffer？
S18
検証処理
S19

【図１２】

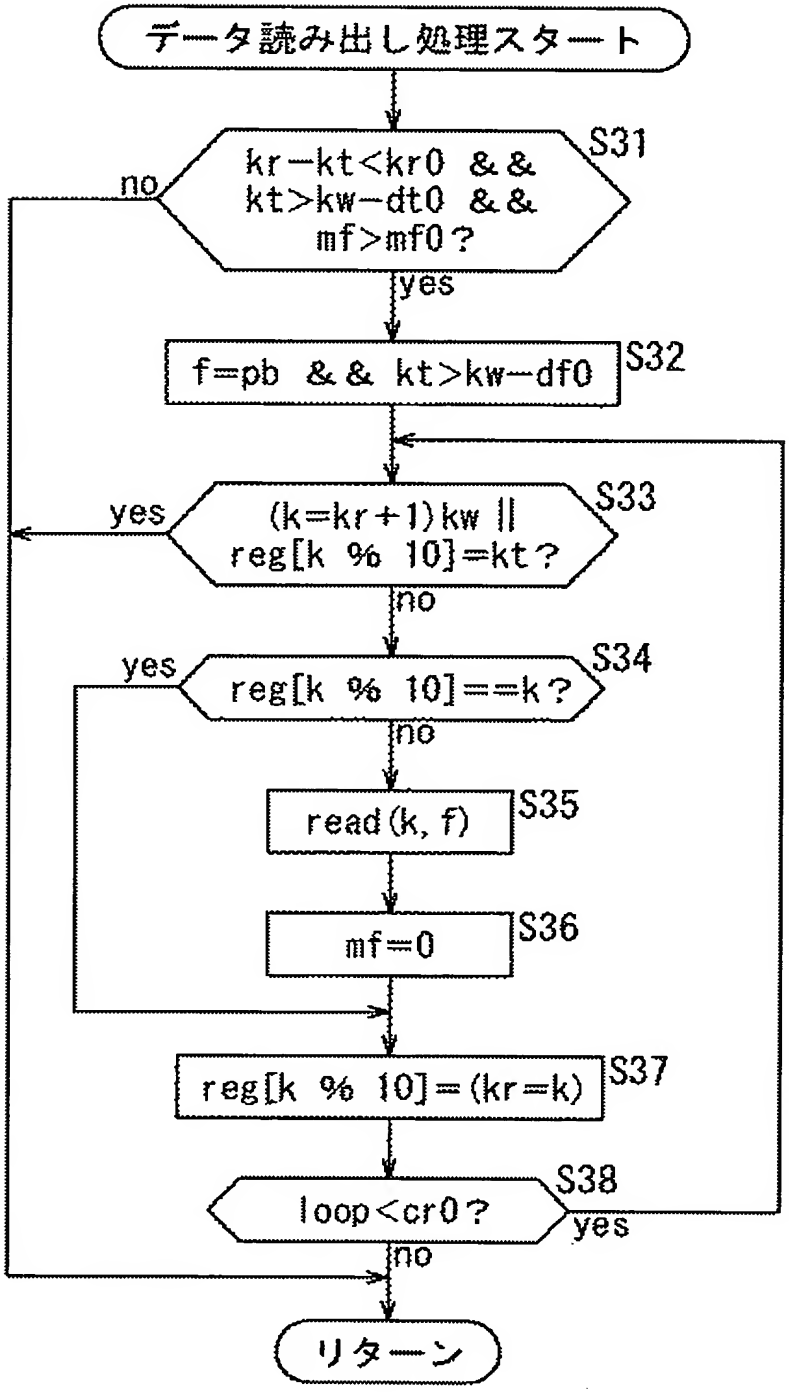
図12


データ保持処理スタート
yes
reading another file?
S21
no
reading same file?
S22
no
yes
kt<kw<kt+10?
S23
yes
no
copy to buf[kw % 10],
reg[kw % 10]=kw
S24
リターン

5

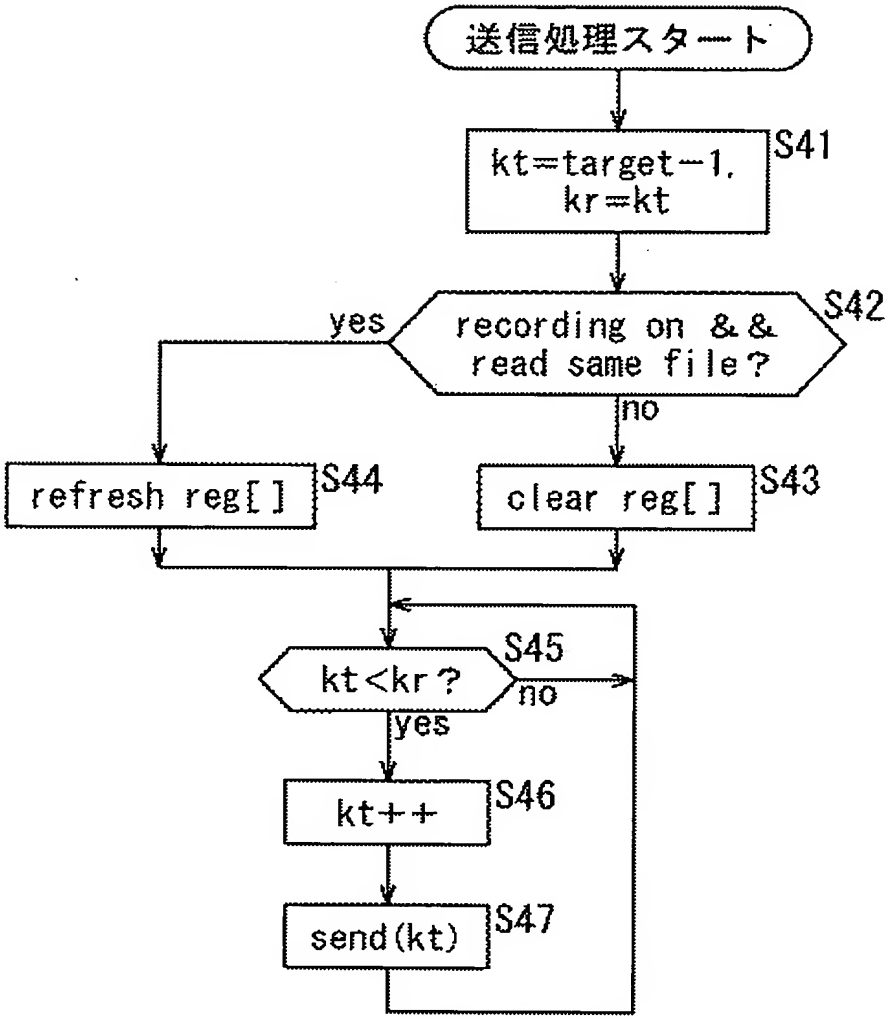
【図１３】

図13


データ読み出し処理スタート
S31
kr−kt<kr0 && kt>kw−dt0 && mf>mf0？
no
yes
S32
f=pb && kt>kw−df0
S33
(k=kr+1)kw || reg[k % 10]=kt？
yes
no
S34
reg[k % 10]==k？
yes
no
S35
read(k, f)
S36
mf=0
S37
reg[k % 10]=(kr=k)
S38
loop<cr0？
yes
no
リターン

【図１４】

図14


送信処理スタート
kt=target−1,
kr=kt
S41
recording on &&
read same file?
S42
yes
no
refresh reg[]
S44
clear reg[]
S43
kt<kr?
S45
no
yes
kt++
S46
send(kt)
S47

5

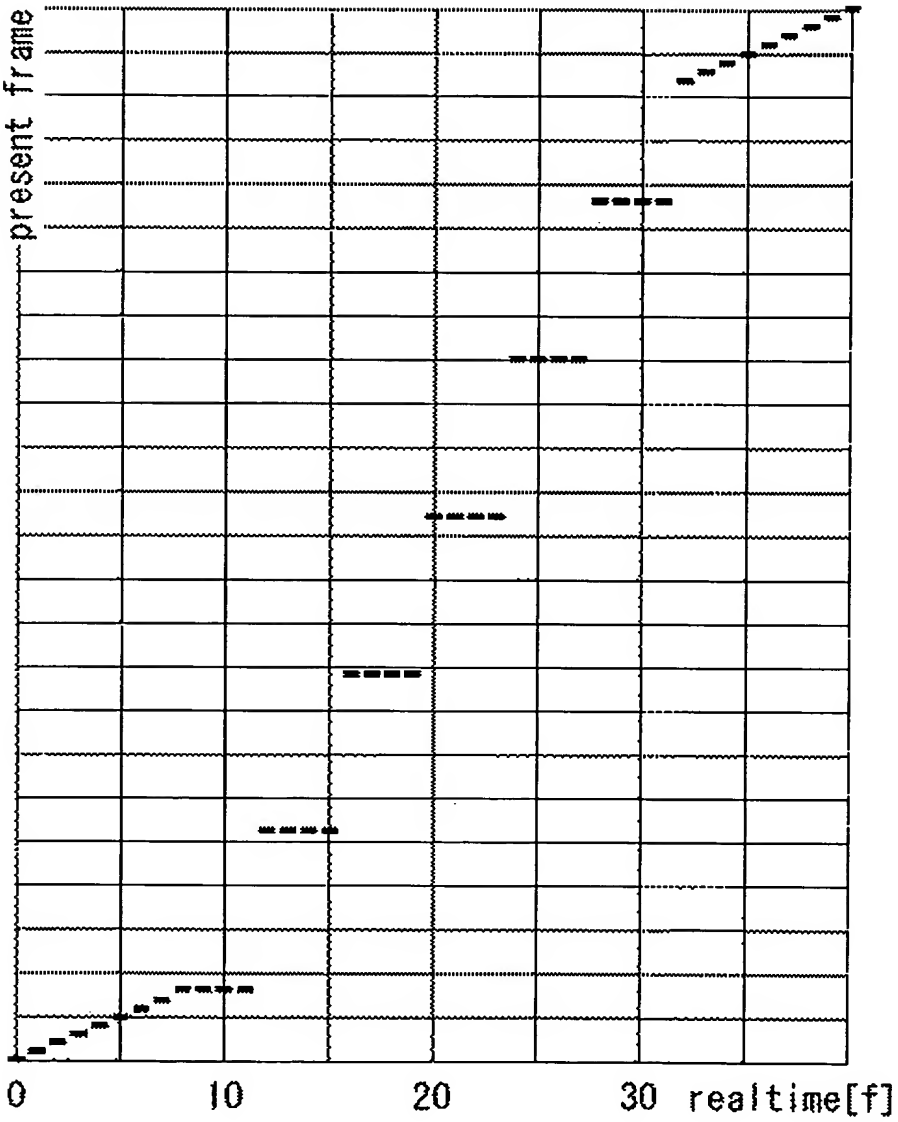
【図１５】

図15

モード	mf0	kr0	コメント
低速度≦128kbps	15	3	30秒以上あけて読む。
中速度、画像再生	5	3	さほど頻繁でもなく読む。
高速度>2Mbps	1	5	読めるだけ読んでしまう。

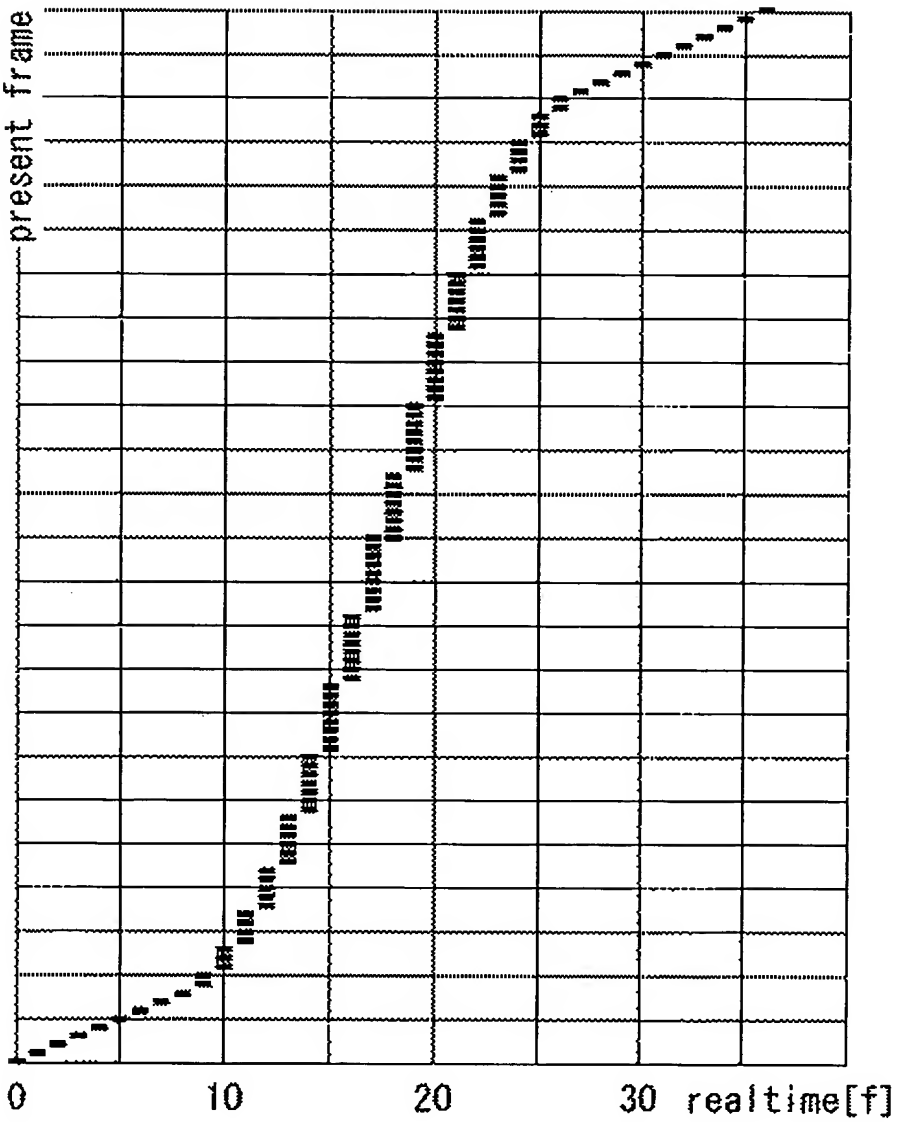
【図１６】

図16



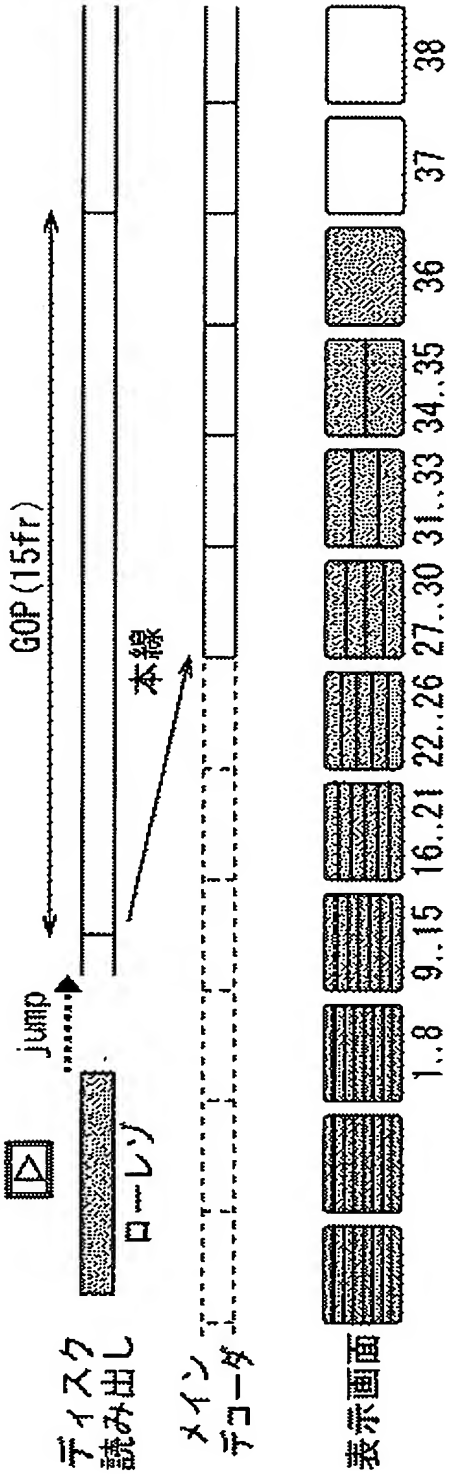
【図１７】

図17



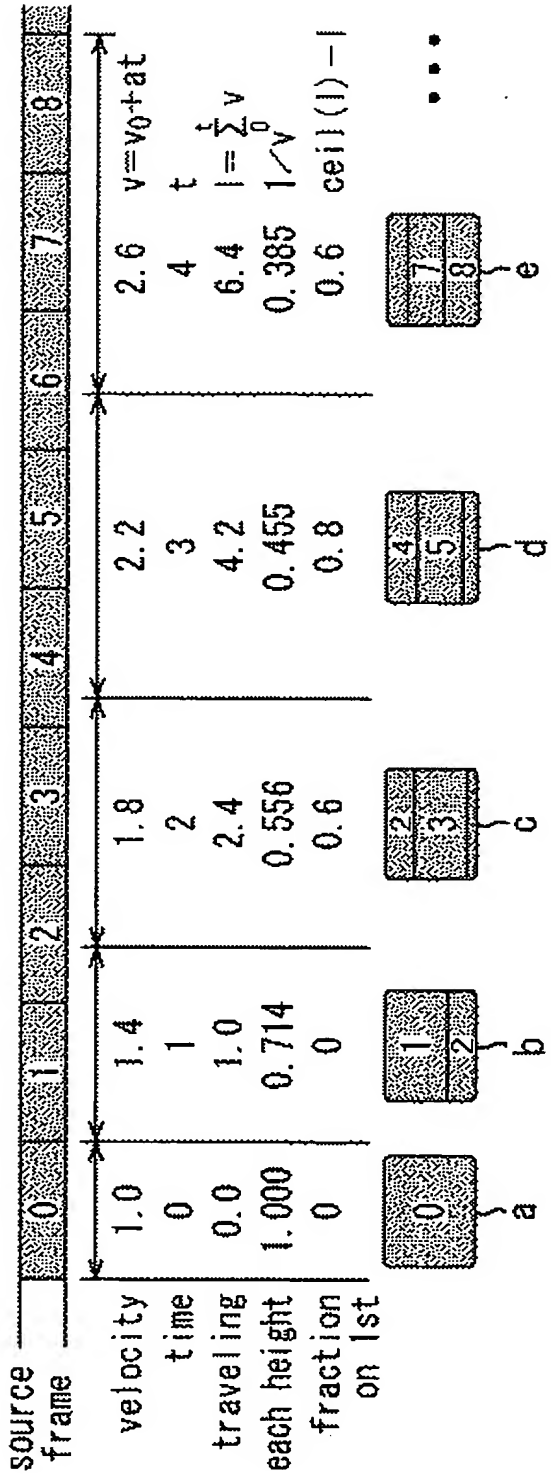
【図１８】

図18


GOP(15fr)
本線
jump
ディスク
読み出し
ローレゾ
メイン
デコーダ
表示画面
1..8
9..15
16..21
22..26
27..30
31..33
34..35
36
37
38

【図１９】

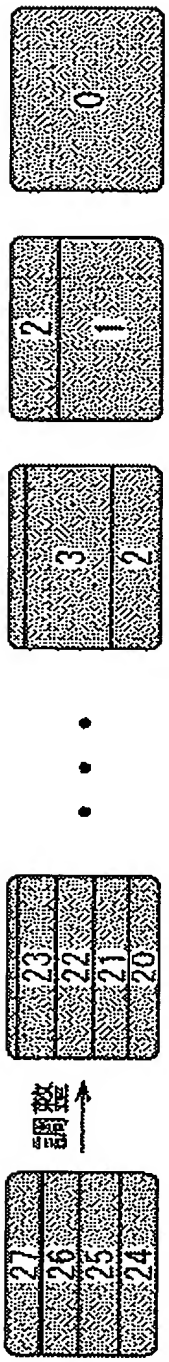
図19


source frame
velocity
time
traveling
each height
fraction on 1st
1.0
0
0.0
1.000
0
1.4
1
1.0
0.714
0
1.8
2
2.4
0.556
0.6
2.2
3
4.2
0.455
0.8
2.6
4
6.4
0.385
0.6
v=v0+at
t
l=Σ v
1/v
ceil(l)-1
a
b
c
d
e
0
1
2
3
4
5
6
7
8

【図２０】

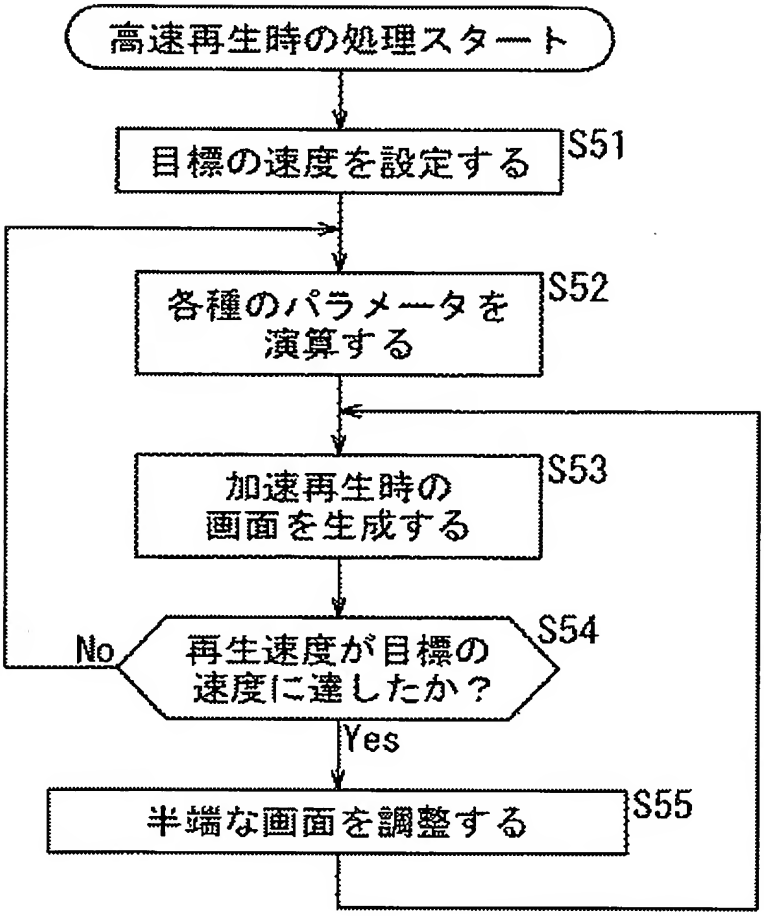
図20

【図２１】
図21



【図２２】

図22


高速再生時の処理スタート
目標の速度を設定する
S51
各種のパラメータを演算する
S52
加速再生時の画面を生成する
S53
No
再生速度が目標の速度に達したか？
S54
Yes
半端な画面を調整する
S55

【書類名】 図面 [Document Name] Drawings

【図１】 [FIG. 1]

光ディスク OPTICAL DISC
ピックアップ PICKUP
ディスクドライブ DISK DRIVE
送信部 TRANSMISSION UNIT
本線データ MAIN TRACK DATA
メインエンコーダ MAIN ENCODER
ビデオ入力 VIDEO INPUT
ローレゾデータ LOW RESOLUTION DATA
ローレゾエンコーダ LOW RESOLUTION ENCODER
リサイズ部 RESIZE SECTION
バッファ BUFFER
メインデコーダ MAIN DECODER
PCI インターフェース PCI INTERFACE
ローレゾデコーダ LOW RESOLUTION DECODER
スイッチ SWITCH
OSD 部 OSD SECTION
スキャンコンバータ SCAN CONVERTER
レディフラグ READY FLAG
ドライブ制御部 DRIVE CONTROL SECTION
ファイルシステム FILE SYSTEM
デバイスドライバ DEVICE DRIVER
メインデコーダ制御部 MAIN DECODER CONTROL SECTION
ローレゾデコーダ制御部 LOW RESOLUTION DECODER CONTROL SECTION
プレイリスト PLAY LIST
タイムコード TIME CODE
メタデータ META DATA
コントローラ CONTROLLER
システムコントローラ SYSTEM CONTROLLER
ディスク記録再生装置 DISC RECORDING/PLAYBACK DEVICE
操作信号 OPERATING SIGNAL
リモコン REMOTE COMMANDER

【図２】 [FIG. 2]

カートン CARTON
タグ TAG
メタデータ META DATA
ローレゾデータ LOW RESOLUTION DATA
オーディオデータ AUDIO DATA
ビデオデータ VIDEO DATA
本線データ MAIN TRACK DATA

【図３】 [FIG. 3]

ディスクドライブからのローレゾデータ　LOW RESOLUTION DATA FROM DISC DRIVE
バッファ　BUFFER
比較部　COMPARISON SECTION
ローレゾエンコーダからのローレゾデータ　LOW RESOLUTION DATA FROM LOW RESOLUTION ENCODER

【図４】　[FIG. 4]
ローレゾデータ書き込み検証処理スタート　START LOW RESOLUTION DATA WRITING VERIFICATION PROCESS
ローレゾデータをバッファに保持したままで光ディスクに記録する
RECORD LOW RESOLUTION DATA ON OPTICAL DISC WHILE STORING LOW RESOLUTION DATA IN BUFFER
次の書き込みまでに時間的な余裕があるか？
ANY EXCESSIVE TIME BEFORE NEXT WRITING?
光ディスクから、先ほど記録したローレゾデータを読み出す
READ OUT PREVIOUSLY RECORDED LOW RESOLUTION DATA FROM OPTICAL DISC
両者を比較する。一致するか？
COMPARE BOTH LOW RESOLUTION DATA WITH EACH OTHER. IDENTICAL?
２回以上連続して不一致であるか？
NOT IDENTICAL FOR SUCCESSIVE TWO OR MORE TIMES?
ピックアップを移動する　MOVE PICKUP
エンド　END

【図５】　[FIG. 5]
ローレゾデータ　LOW RESOLUTION DATA
再書き込み　REWRITE
書き込みタイミング　WRITING TIMING
読み出しタイミング　READOUT TIMING
本線データ　MAIN TRACK DATA

【図６】　[FIG. 6]
ローレゾデータ　LOW RESOLUTION DATA
再書き込み　REWRITE
ピックアップを移動　MOVE PICKUP
書き込みタイミング　WRITING TIMING
読み出しタイミング　READOUT TIMING
本線データ　MAIN TRACK DATA

【図７】　[FIG. 7]
ビデオ入力　VIDEO INPUT
書き込みタイミング　WRITING TIMING
読み出しタイミング　READOUT TIMING
ビデオ出力　VIDEO OUTPUT

【図８】 [FIG. 8]
ビデオ入力 VIDEO INPUT
書き込みタイミング WRITING TIMING
読み出しタイミング READOUT TIMING
ビデオ出力 VIDEO OUTPUT

【図９】 [FIG. 9]
送信部へ TO TRANSMISSION SECTION
ディスクドライブからのローレゾデータ LOW RESOLUTION DATA FROM DISC DRIVE
バッファ BUFFER
ローレゾエンコーダからのローレゾデータ LOW RESOLUTION DATA FROM LOW RESOLUTION ENCODER

【図１０】 [FIG. 10]
ビデオ入力 VIDEO INPUT
書き込みタイミング WRITING TIMING
読み出しタイミング READOUT TIMING
送信タイミング TRANSMISSION TIMING

【図１１】 [FIG. 11]
書込み処理スタート START WRITING PROCESS
データ保持処理 DATA STORAGE PROCESS
データ読み出し処理 DATA READOUT PROCESS
検証処理 VERIFICATION PROCESS

【図１２】 [FIG. 12]
データ保持処理スタート START DATA STORAGE PROCESS
リターン RETURN

【図１３】 [FIG. 13]
データ読み出し処理スタート START DATA READOUT PROCESS
リターン RETURN

【図１４】 [FIG. 14]
送信処理スタート START TRANSMISSION PROCESS

【図１５】 [FIG. 15]
モード MODE
コメント COMMENTS
低速度 LOW SPEED
30秒以上あけて読む。 READ AT INTERVAL OF 30 SECONDS OR MORE
中速度、画像再生 MIDDLE SPEED, IMAGE PLAYBACK
さほど頻繁でもなく読む。 READ NOT FREQUENTLY

高速度　　HIGH SPEED
読めるだけ読んでしまう。　　READ AS MUCH AS POSSIBLE

【図１６】　　[FIG. 16]

【図１７】　　[FIG. 17]

【図１８】　　[FIG. 18]
ディスク読み出し　DISC READOUT
ローレゾ　　LOW RESOLUTION
本線　　MAIN TRACK
メインデコーダ　　MAIN DECODER
表示画面　　DISPLAY SCREEN

【図１９】　　[FIG. 19]

【図２０】　　[FIG. 20]
調整　　ADJUSTMENT

【図２１】　　[FIG. 21]
調整　　ADJUSTMENT

【図２２】　　[FIG. 22]
高速再生時の処理スタート　　START PROCESS FOR HIGH-SPEED PLAYBACK
目標の速度を設定する　　SET TARGET SPEED
各種のパラメータを演算する　　CALCULATE VARIOUS PARAMETERS
加速再生時の画面を生成する　　GENERATE SCREEN FOR ACCELERATED PLAYBACK
再生速度が目標の速度に達したか？　　PLAYBACK SPEED REACHES TARGET SPEED?
半端な画面を調整する　　ADJUST ODD AREA ON SCREEN

[Document Name] Abstract of the Disclosure

[Abstract]

[Problem]

When a recording rate of data is close to a writing rate on a recording medium, recorded data is externally transmitted.

[Means for Solving]

The problems are solved by: an efficient separate use of data in a buffer and read out data; and the use of low resolution data. As illustrated, the 0th to third low resolution data to be transmitted are not read out from an optical disc because the data remain at the time of transmission. Instead, the buffered data is transmitted. When the fourth low resolution data is to be transmitted, the fourth to sixth low resolution data are read out from the optical disc for transmission because the data have already been erased from the buffer. The present invention is applicable to, for example, a disc recorder.

[Selected Drawing] Fig. 10